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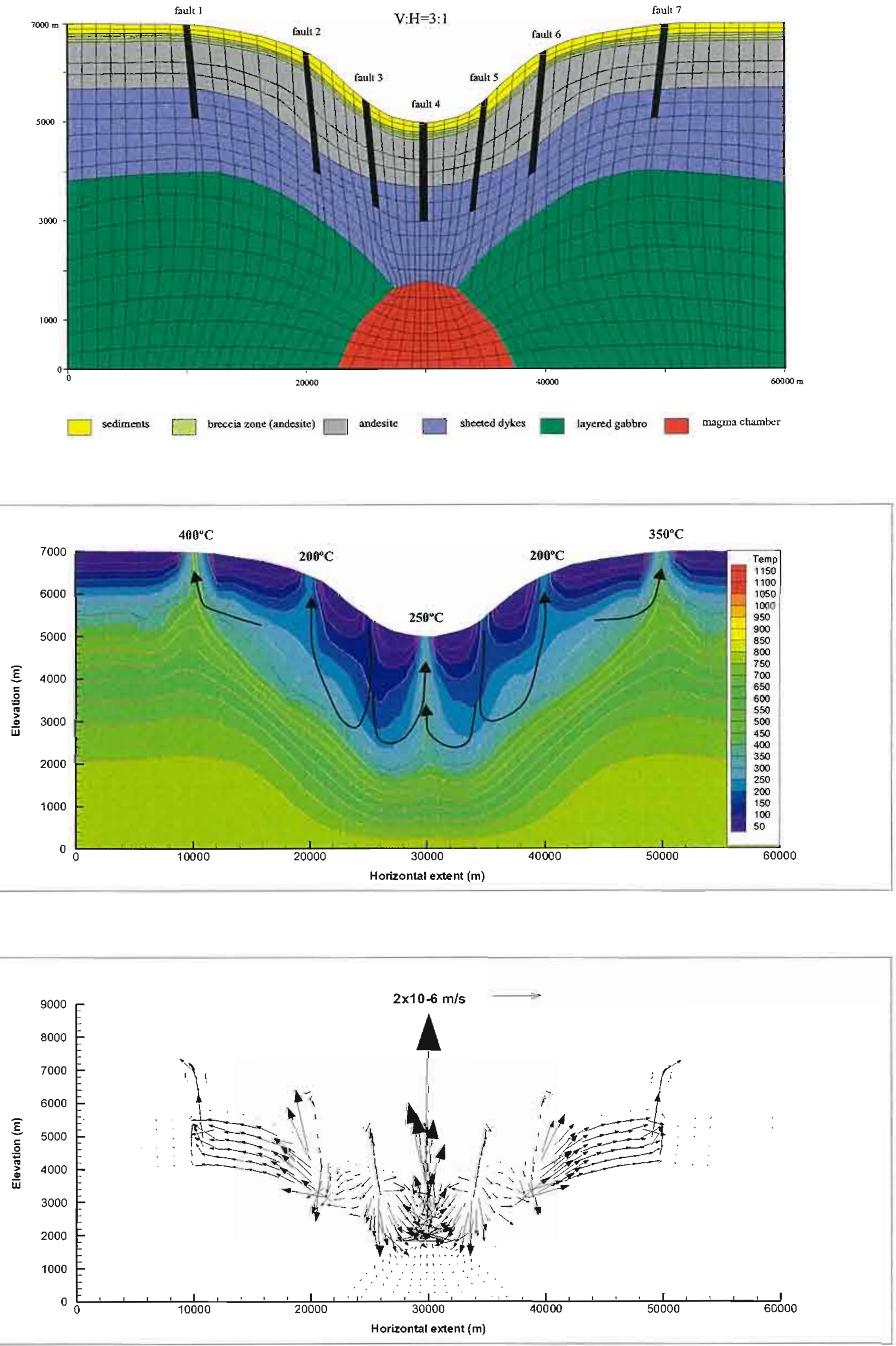
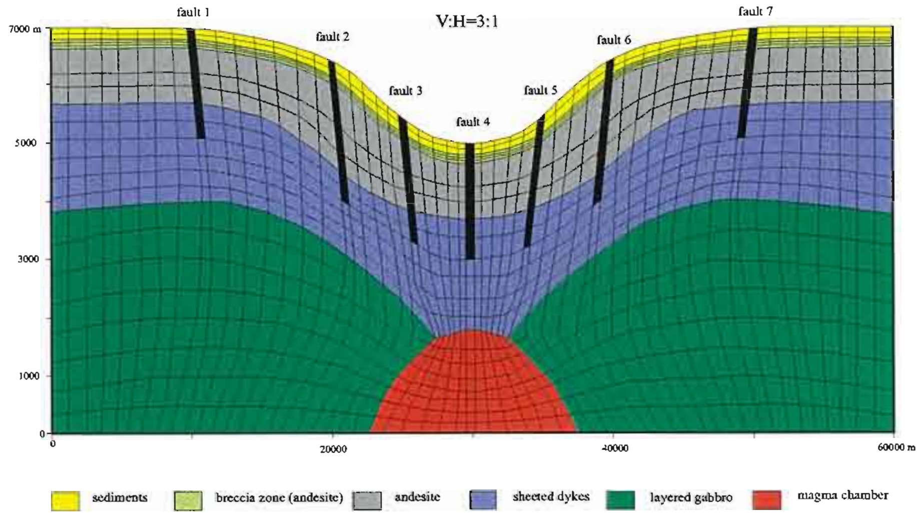
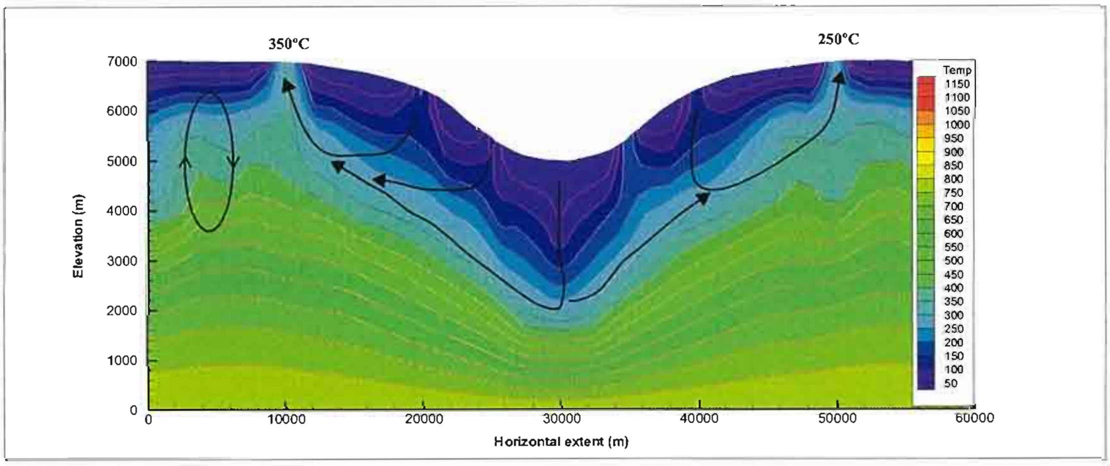
Appendices

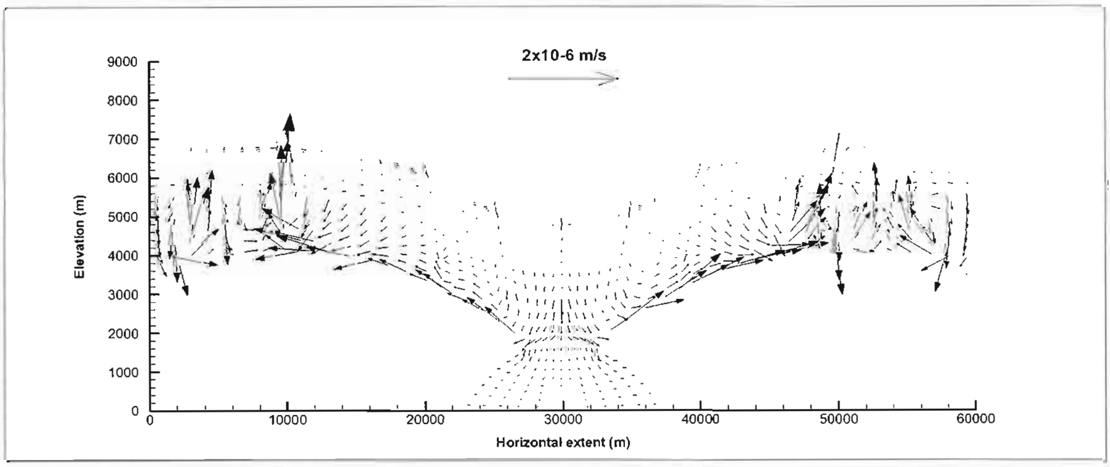
Appendices A 1 – A 10	Modeling results for the simple Lau basin model. All results for this model are shown after 75,000 years to allow comparison. Arrows show main fluid migration pathways and fluid discharge temperatures above 150ºC are indicated.
Appendix A 11	List of rock properties and fault permeabilities for all summary graphs
Appendices A 12 – A 14	Modeling results for the 'realistic' Lau basin model. Modeling results for this model are shown after 10,000 and 30,000 years respectively to allow comparison.
Appendix A 15	Stratigraphy of the Archean Pilbara Craton in the North Shaw area.
Appendix A 16	Summary of modeling results for the Panorama model with 3 active faults (fault1, 3, and 5)
Appendix A 17	Summary of modeling results for the Panorama model with all faults activated
Appendices A 18 – A 31	Modeling results for the Panorama model. Modeling results for the Panorama model are shown at the midway point of the calculations, i.e. halfway between the onset of hydrothermal fluid circulation and the essential shutdown of the hydrothermal system, i.e. discharge temperatures drop below 150ºC. The choice of display for this model is necessary because it is not possible to display all tested models for the Panorama district at one representative time.



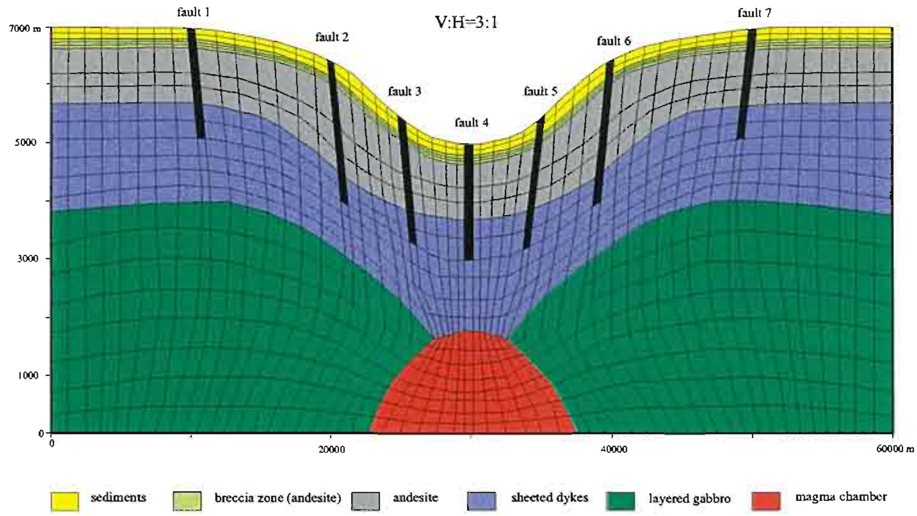
A 1 Modeling results for the Lau basin at low rock permeability (Breccia zone: $1.3x10^{-17}$ m^2, Andesite: 10^{-18} m^2) and average fault permeability ($2.5x10^{-14}$ m^2) after 75,000 years. Most fluid recharge occurs in the topographic depression and fluid discharge at topographic highs as well as directly above the magma chamber. For a listing of all other rock properties see table 4.1

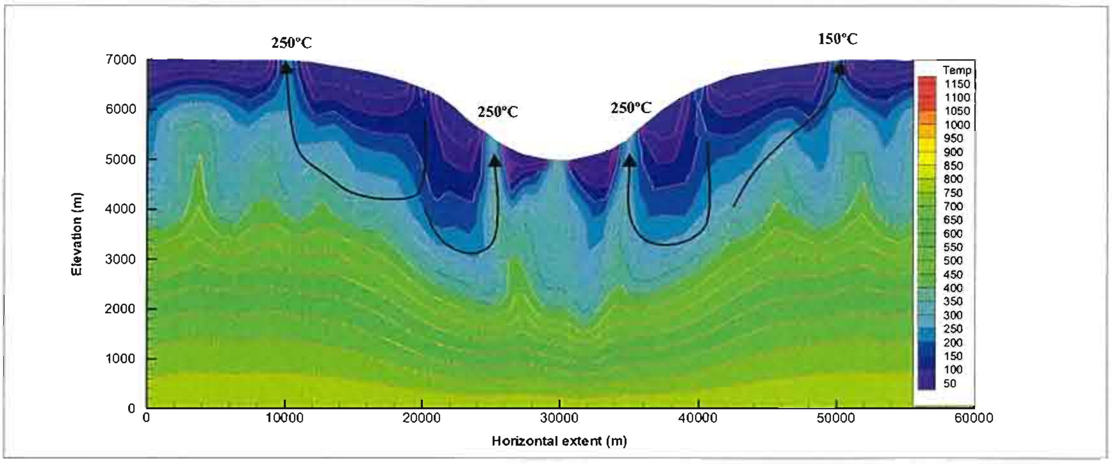


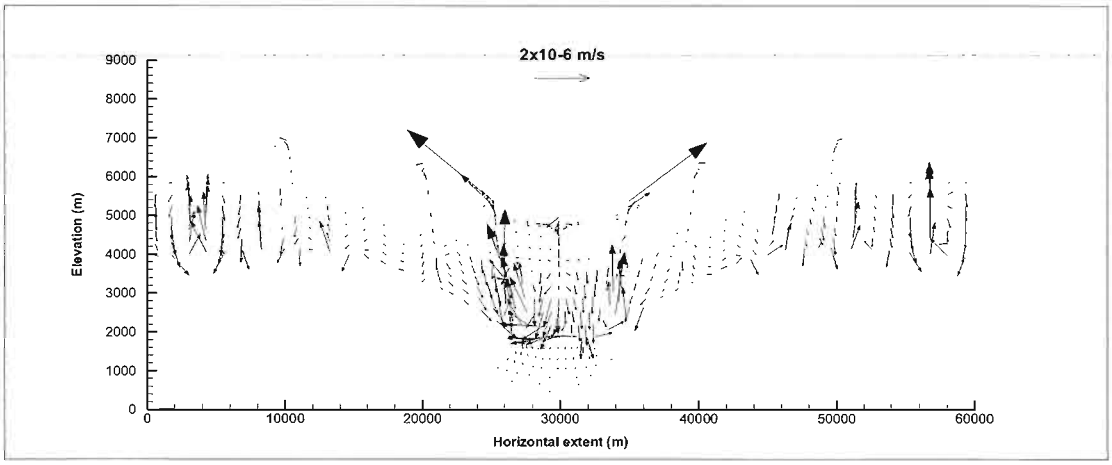




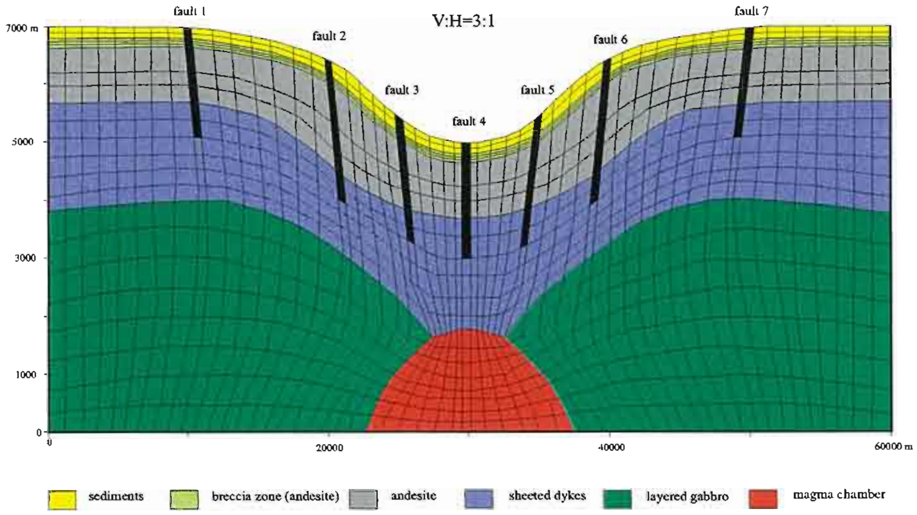
A 2 Modeling results for the Lau basin at average rock (Breccia zone: $1.3x10^{-16}$ m^2, Andesite: 10^{-17} m^2) and low fault permeability ($2.5x10^{-15}$ m^2) after 75,000 years. Here fluid discharge occurs through fault 1, and 7, and fluid recharge is predicted to take place through fault 2 to 6.

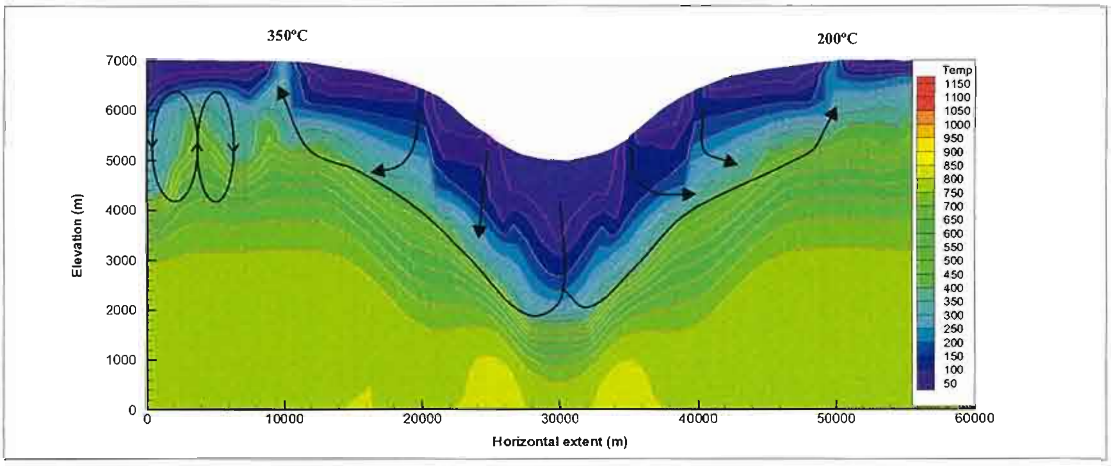


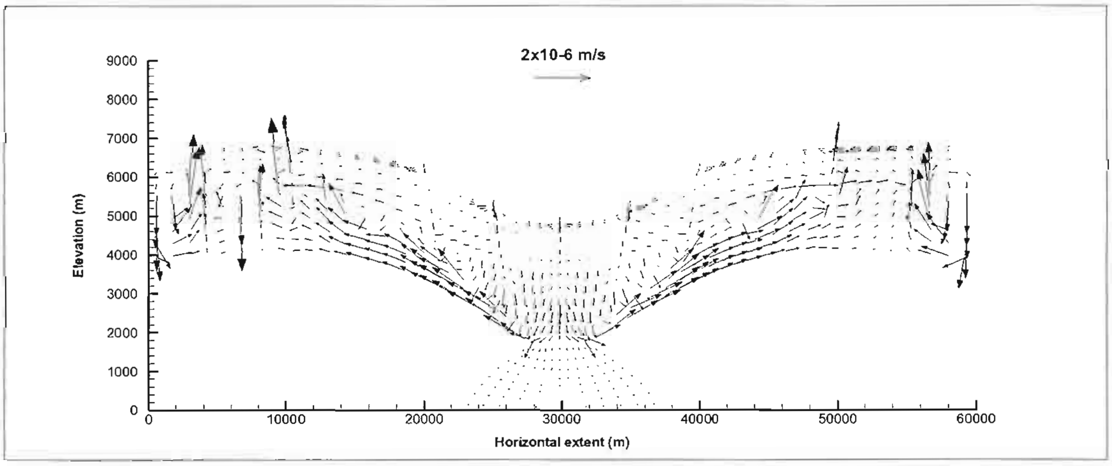




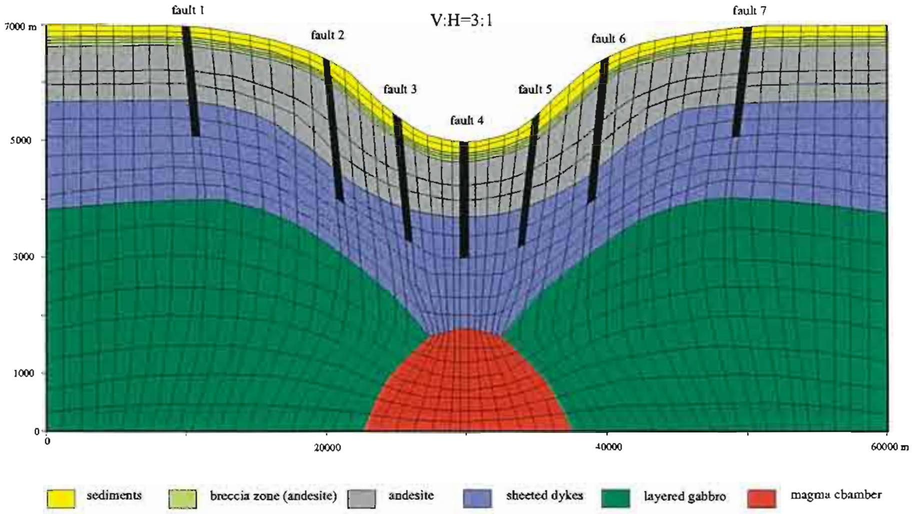
A 3 Modeling results for Lau basin at average rock permeability (Breccia zone: $1.3x10^{-16}$ m^2, Andesite: 10^{-17} m^2) and high fault permeability ($2.5x10^{-13}$ m^2) after 75,000 years. This permeability arrangement produces additional fluid discharge through fault near the magma chamber (fault 3 and 5) compared to other rock and fault permeability models.

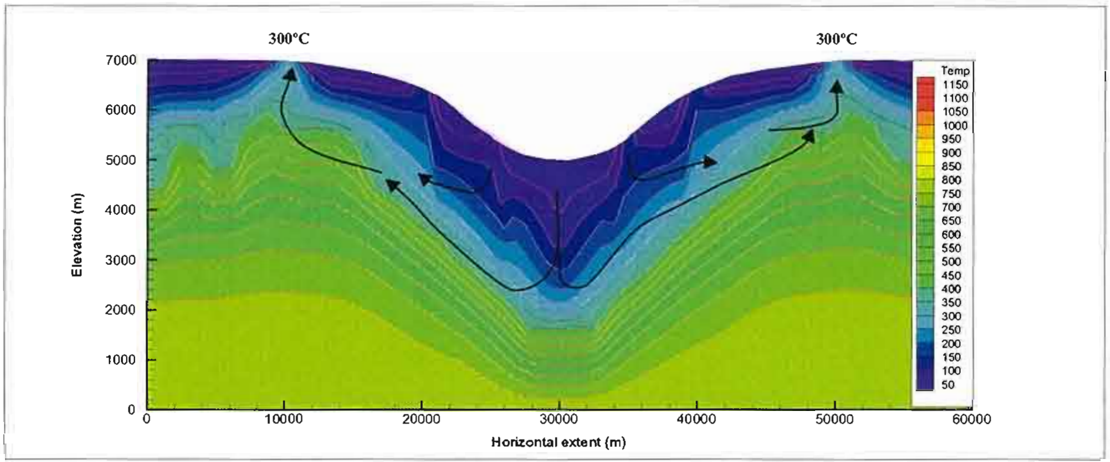


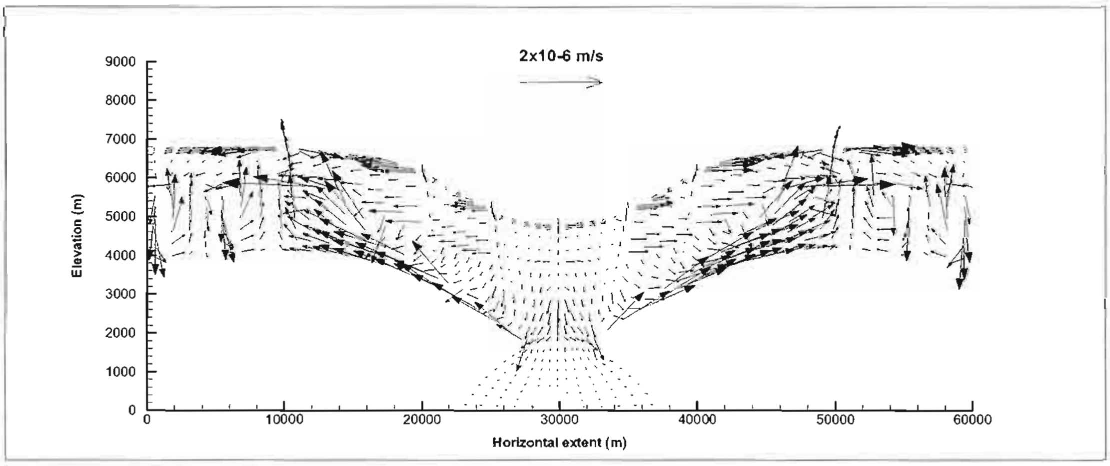




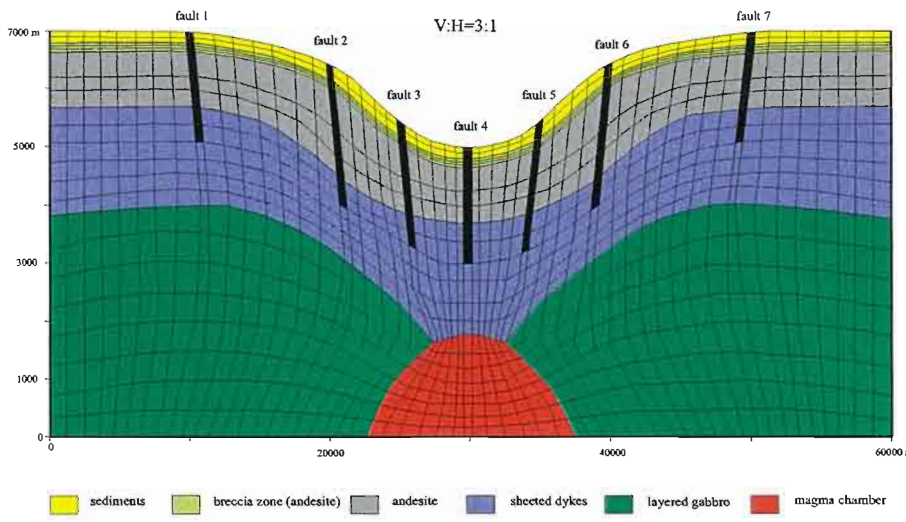
A 4 Modeling results for simulations of the Lau basin at high rock permeabilities (Breccia zone: 1.3×10^{-15} m^2, Andesite: 10^{-16} m^2) and average fault permeability (2.5×10^{-14} m^2) after 75,000 years. The higher permeability causes the system to cool down more quickly and results show the hydrothermal system past its peak of activity. Results predict the development of a large central recharge zone and the occurrence of convection cells at the outer boundaries due to the 'boundary effect' discussed in the text.

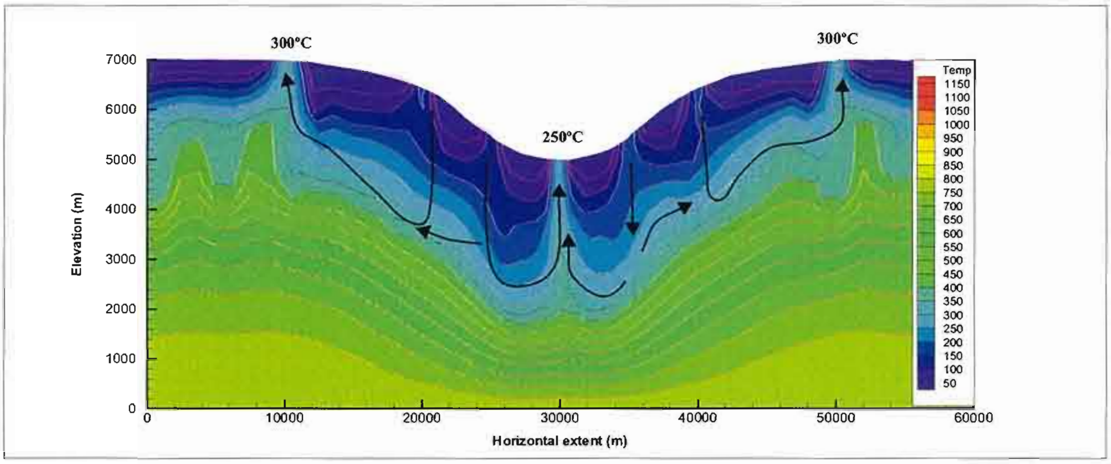


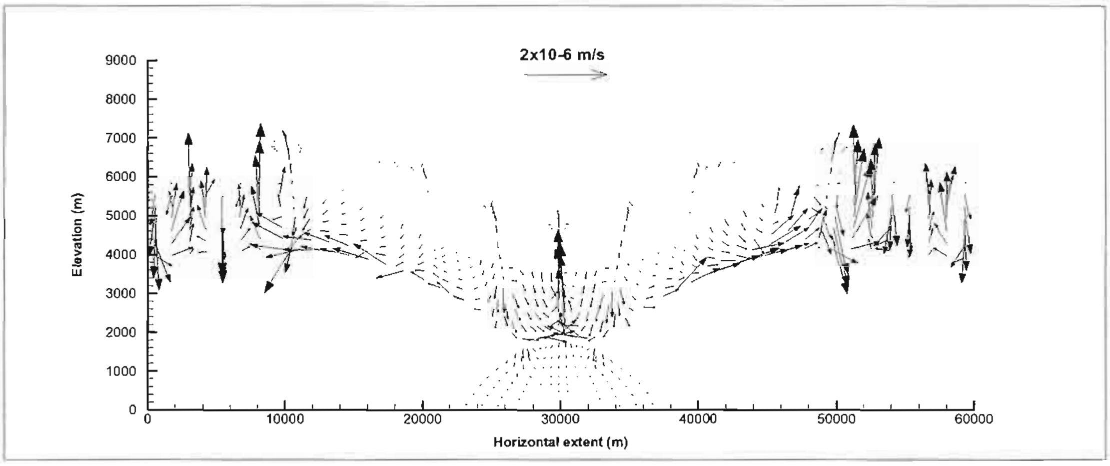




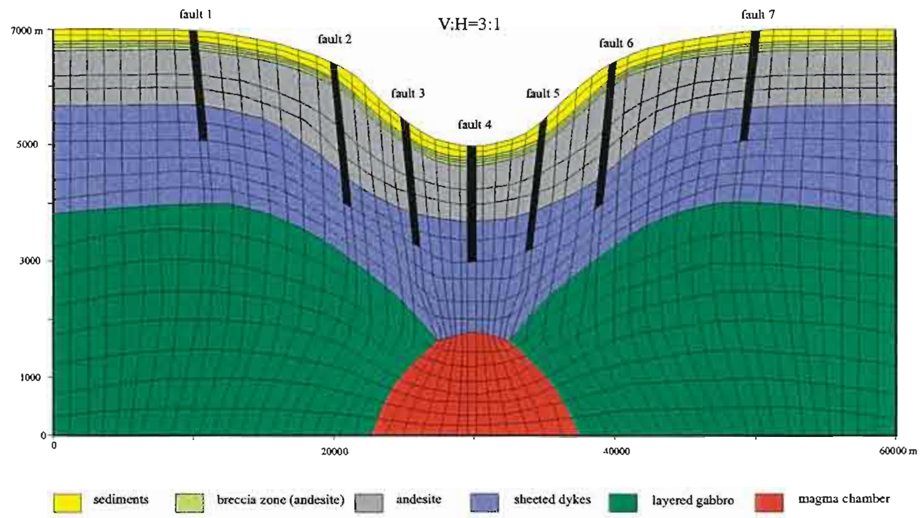
A 5 Modeling results for simulations of the Lau basin with average rock (Breccia zone: 1.3×10^{-16} m^2, Andesite: 10^{-17} m^2) and average fault permeability (2.5×10^{-14} m^2) at minimum rock porosity (1 %) after 75,000 years. Results are similar to results with average porosity except for fault 4, which does not exhibit fluid discharge; main fluid discharge occurs at topographic highs with recharge occurring in between.

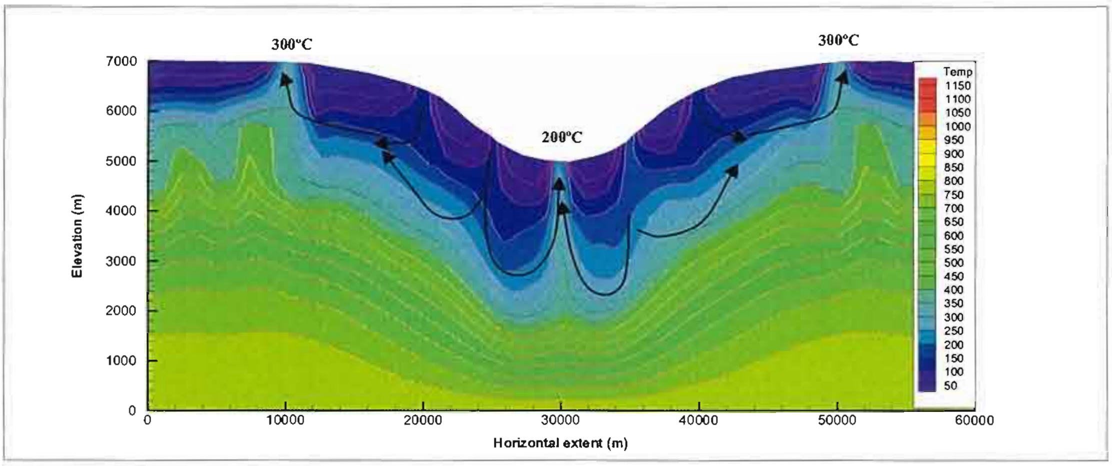


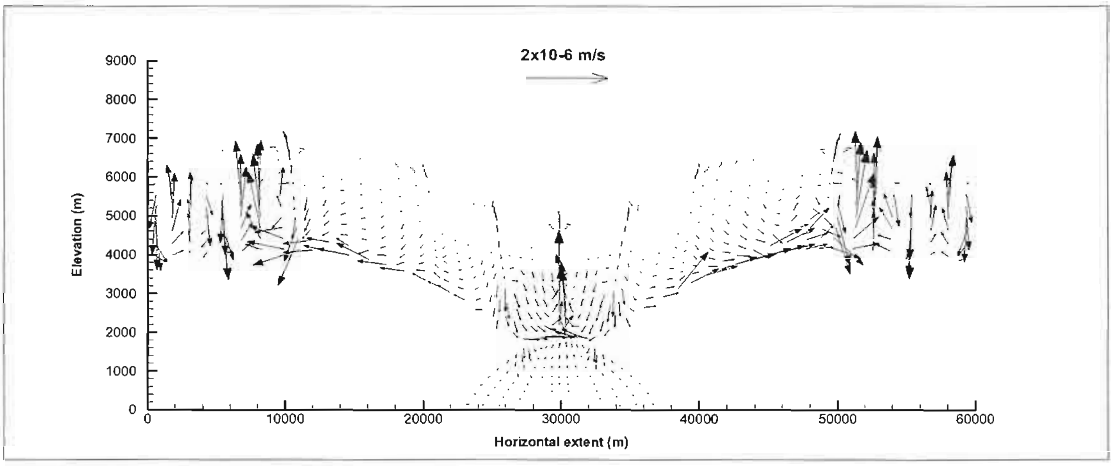




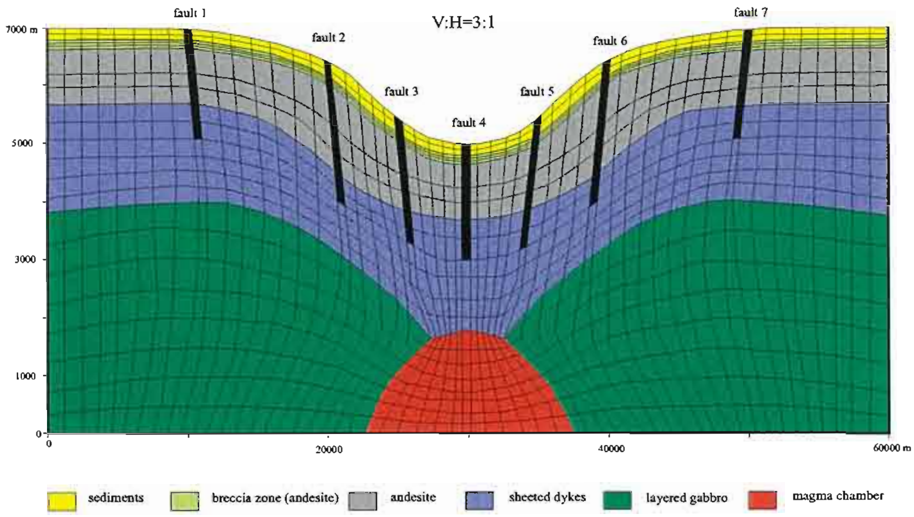
A 6 Modeling results for the Lau model at average rock (Breccia zone: 1.3×10^{-16} m^2, Andesite: 10^{-17} m^2) and average fault permeability (2.5×10^{-14} m^2) under maximum rock porosity conditions (20 %) after 75,000 years. As for simulations with medium porosity, fluid discharge is restricted to topographic elevated positions and the top of the heater, while fluid recharge is occurring in the topographic depression.

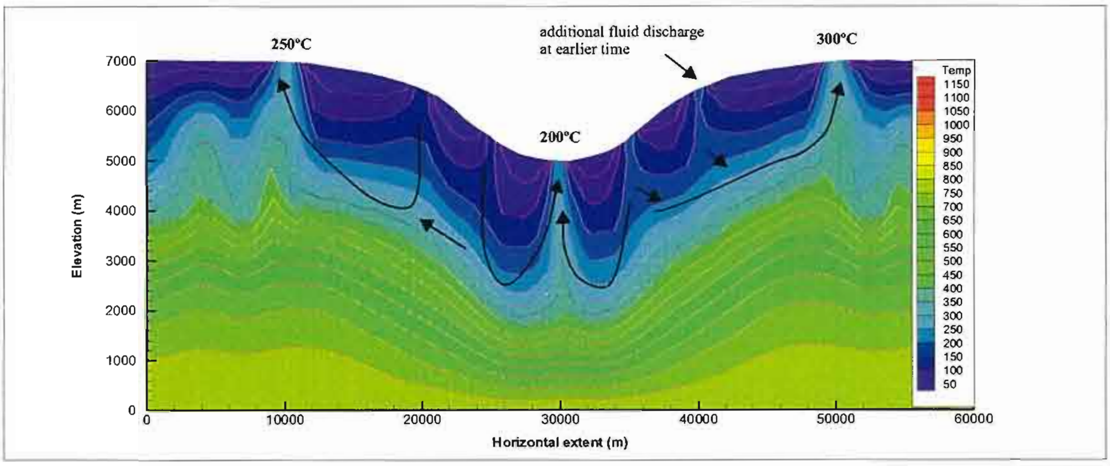


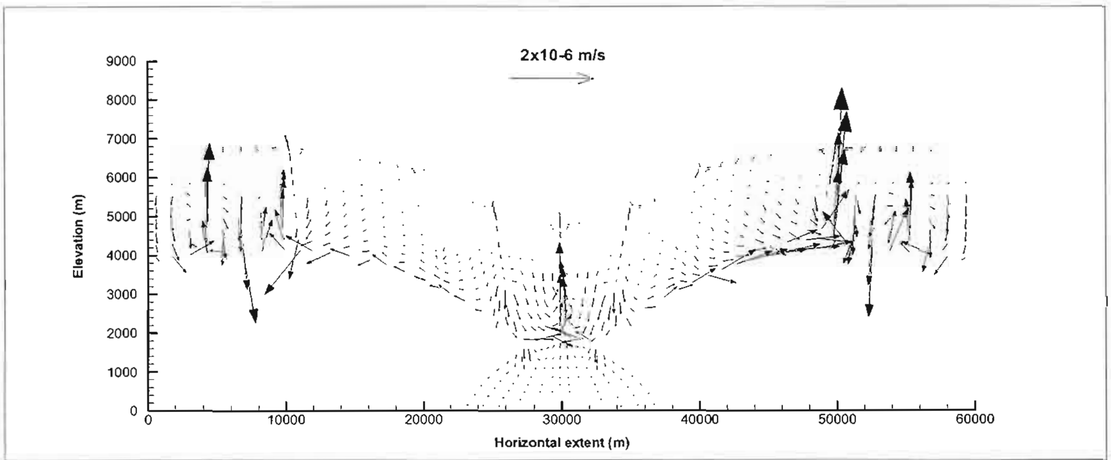




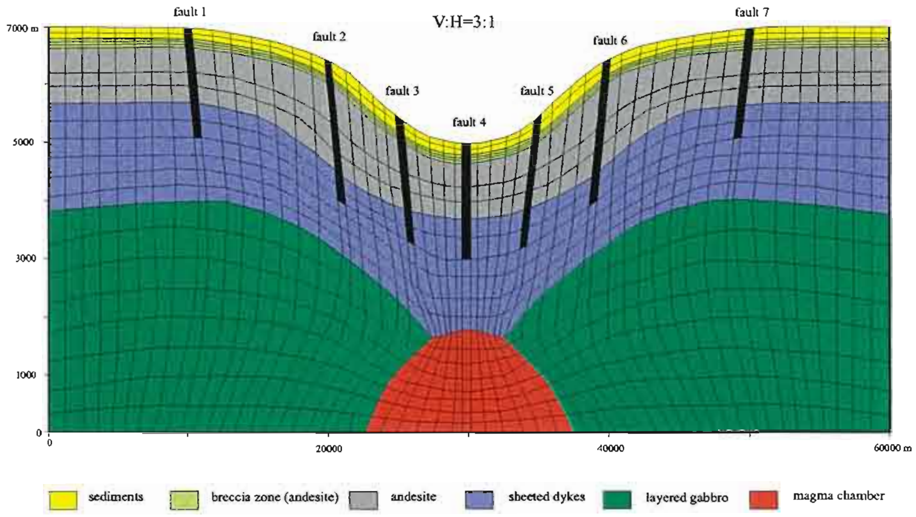
A 7 Modeling results for the Lau model with average rock (Breccia zone: $1.3x10^{-16}$ m^2, Andesite: 10^{-17} m^2) and average fault permeability ($2.5x10^{-14}$ m^2) at minimum thermal conductivity (1.2 - 2 W/m*C) after 75,000 years. No significant differences exist compared to simulations with average thermal conductivity (compare with figure 4.14). As noted before, fluid discharge temperatures are higher at elevated topographic positions compared to other discharge sites.

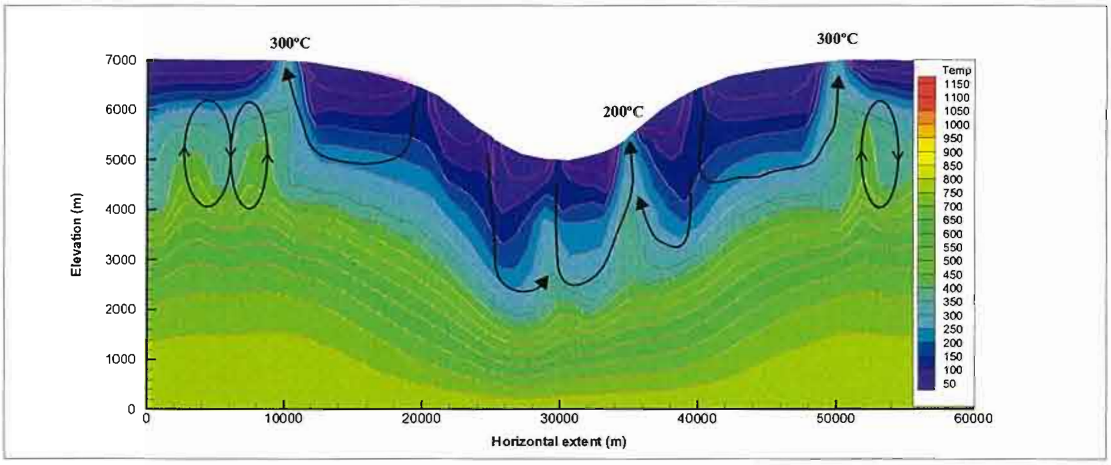


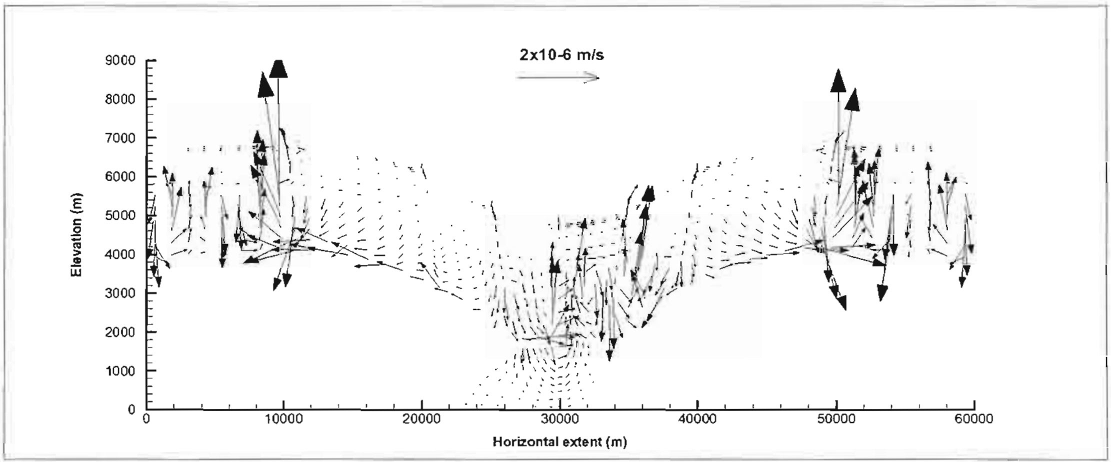




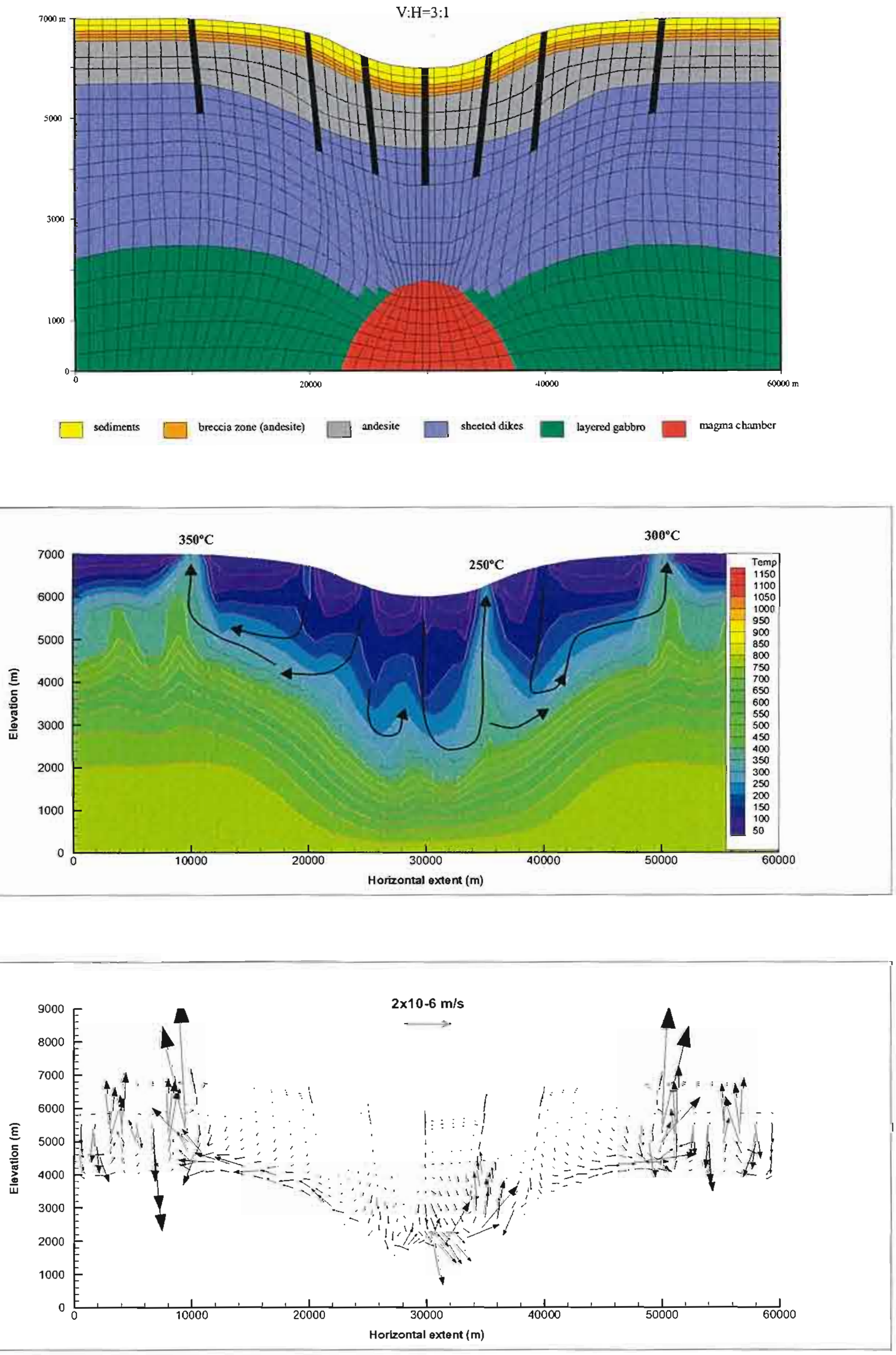
A 8 Modeling results for the Lau model with average rock (Breccia zone: $1.3x10^{-16}$ m^2, Andesite: 10^{-17} m^2) and average fault permeability ($2.5x10^{-14}$ m^2) at maximum thermal conductivity (2 - 3.7 W/m*C) after 75,000 years. No significant differences exist compared to simulations with average or lower thermal conductivity except that in addition fluid discharge recorded for fault 5.







A 9 Modeling results after 75,000 years for simulations of the Lau model with average rock (Breccia zone: $1.3x10^{-16}$ m^2, Andesite: 10^{-17} m^2) and average fault permeability ($2.5x10^{-14}$ m^2) and a simulated dike intrusion below fault 4. The intrusion of the dike causes fluid flow to direct fluid discharge to fault 5 instead of fault 4 as may be expected. The general hydrothermal fluid flow regime remains unaffected. It is important to remember, that these illustrations are snapshots of the hydrothermal system and may change throughout the whole lifetime of the hydrothermal system.

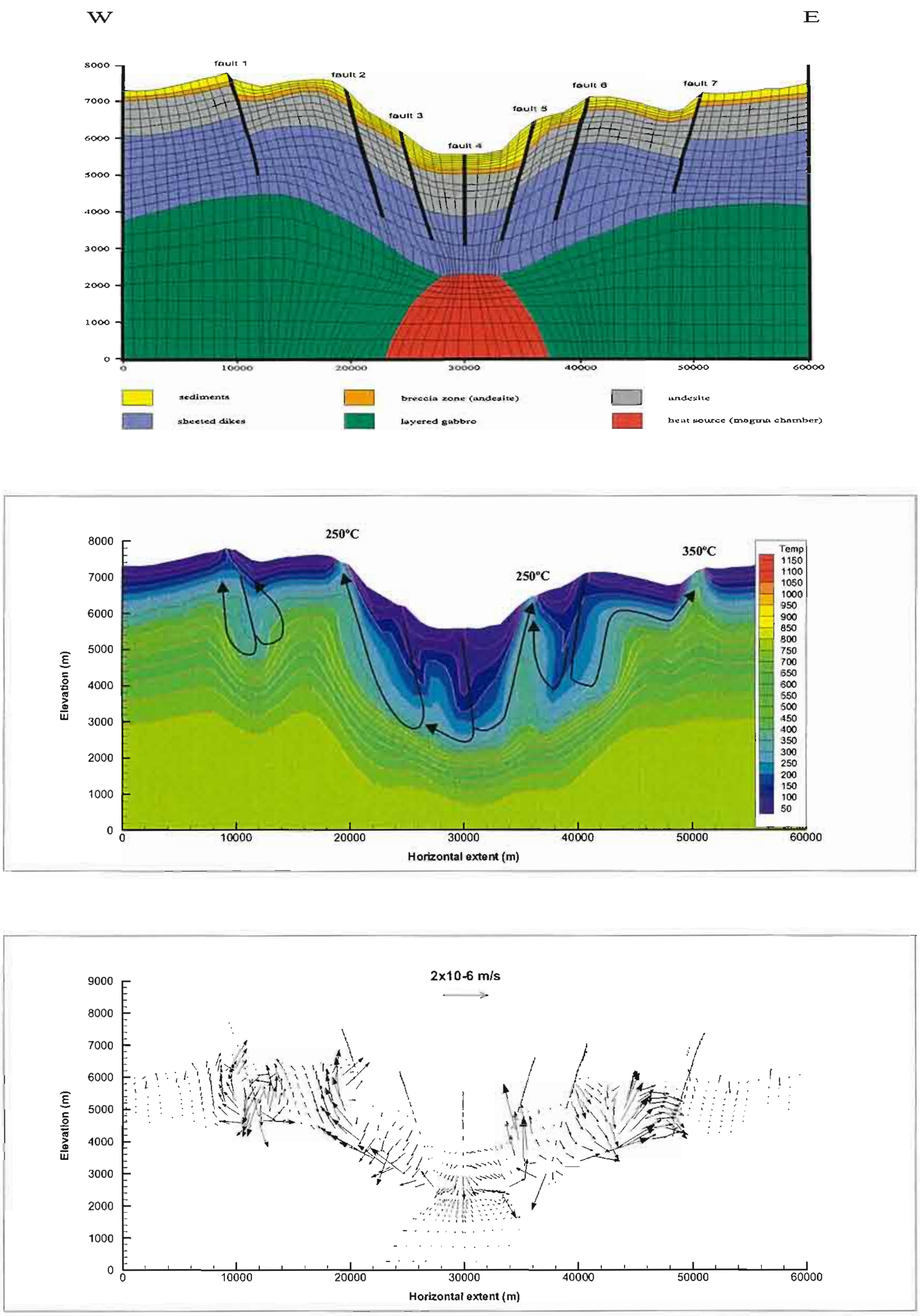


A 10 Modeling results after 75,000 years for simulations of the simple Lau model with average rock (Breccia zone: 1.3×10^{-16} m^2, Andesite: 10^{-17} m^2) and average fault permeability (2.5×10^{-14} m^2) and a simulated cracking front (see text for explanation). As under most other simulation conditions, fluid discharge occurs at the outermost and central fault, while recharge is confined to the inner faults; the general hydrothermal fluid flow regime remains unaffected, while conditions for individual faults may differ, i.e. fault 5 (see chapter 4.5.3). Note that this simulations has been conducted with the reduced surface and basement topography model to maximise the effect of a thermal cracking front by exposing the heat source to a potentially higher fluid flux unaffected by nearby basement topography.

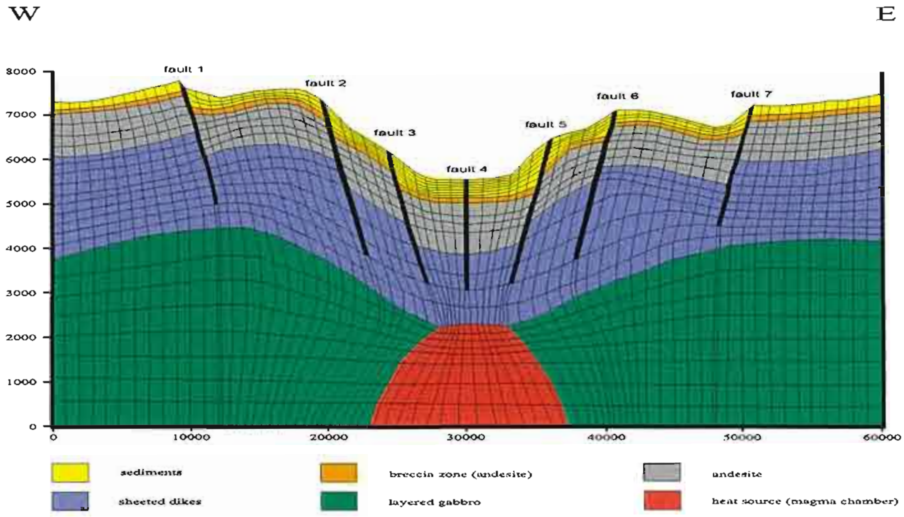
Appendix A 11 List of rock properties and fault permeability for all summary graphs of discharge temperatures and fluid flow velocities for the simple and 'realistic' Lau basin model

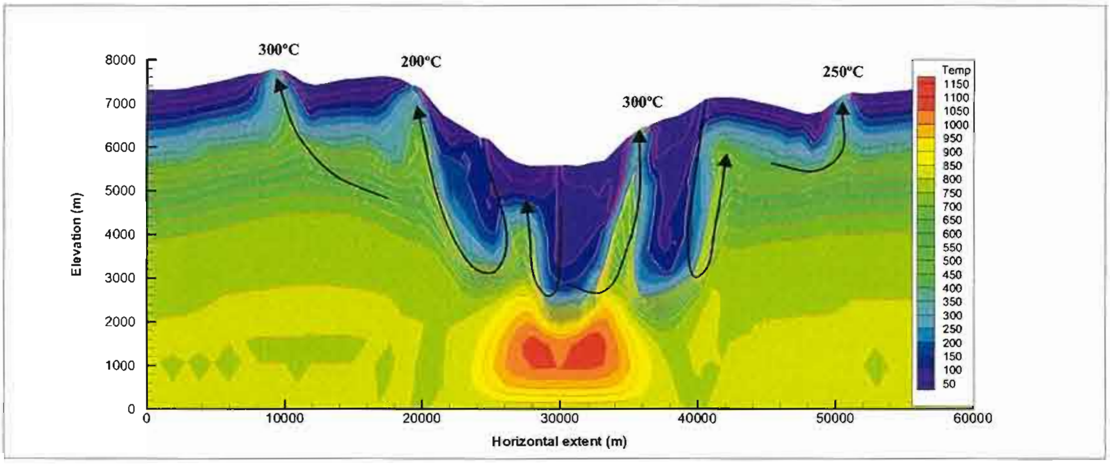
Figure number	Rock permeability (m^2) Breccia zone	Andesite	Fault permeability (m^2)	Remarks
4.10, 4.12	$1.3x10^{-17}$ $1.3x10^{-16}$ $1.3x10^{-15}$	10^{-18} 10^{-17} 10^{-16}	$2.5x10^{-14}$	low rock permeability average rock permeability high rock permeability
4.11	same as 4.8		same as 4.8	same as 4.8 (linear scale)
4.13	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	$Porosity_{low}$ (1 %) Breccia zone $Porosity_{low}$ (1 %) Andesite $Porosity_{ave}$ (12 %) Breccia zone $Porosity_{ave}$ (8 %) Andesite $Porosity_{high}$ (20 %) Breccia zone $Porosity_{high}$ (20 %) Andesite
4.14	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	Th. $conductivity_{low}$ (1.2) Breccia zone Th. $conductivity_{low}$ (1.2) Andesite Th. $conductivity_{ave}$ (1.5) Breccia zone Th. $conductivity_{ave}$ (1.5) Andesite Th. $conductivity_{high}$ (3.7) Breccia zone Th. $conductivity_{high}$ (3.2) Breccia zone
4.18, 4.19	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-15}$ $2.5x10^{-14}$ $2.5x10^{-13}$	low fault permeability (all faults) average fault permeability (all faults) high fault permeability (all faults)
4.21, 4.22	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$ $5x10^{-14}$	all faults except fault 4 fault4
4.23	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	fault 3 extended
4.24	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	fault 7 extended
4.26, 4.27	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	modified surface topography
4.31, 4.32	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	modified basement topography
4.34	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	simulated dike injection below fault 4
4.40, 4.41	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	open side boundaries
4.45, 4.46	$1.3x10^{-16}$	10^{-17}	$2.5x10^{-14}$	Simulated cracking front, rock permeabilities are changed as a function of temperature (see text)
4.50, 4.51	$1.3x10^{-16}$ $1.3x10^{-17}$ $1.3x10^{-16}$ $1.3x10^{-16}$	10^{-17} 10^{-18} 10^{-17} 10^{-17}	$2.5x10^{-14}$ $2.5x10^{-14}$ $2.5x10^{-13}$ $2x10^{-14}$	original low rock K high fault K open boundaries [comparison of simulations for the 'realistic' Lau basin model]

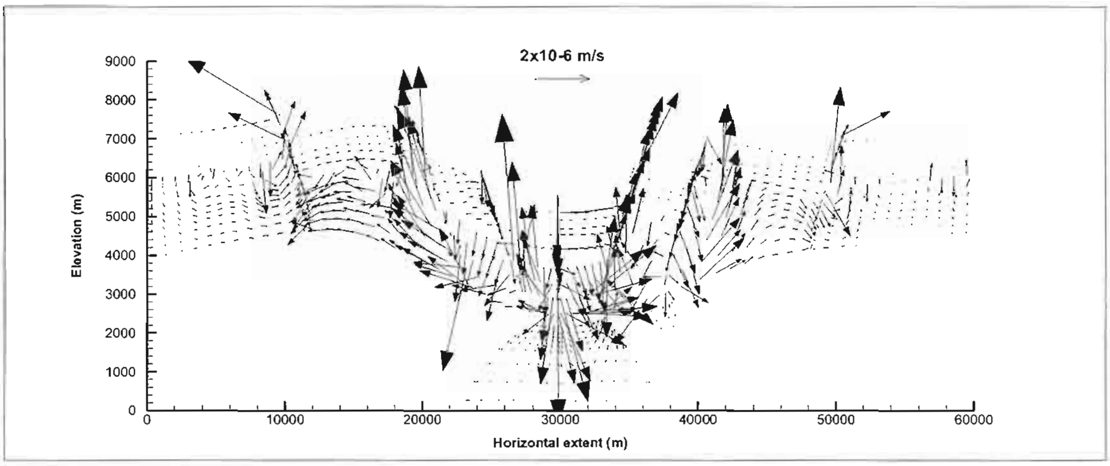
Note: Rock properties for sediments, sheeted dike complex and layered gabbro were kept constant.



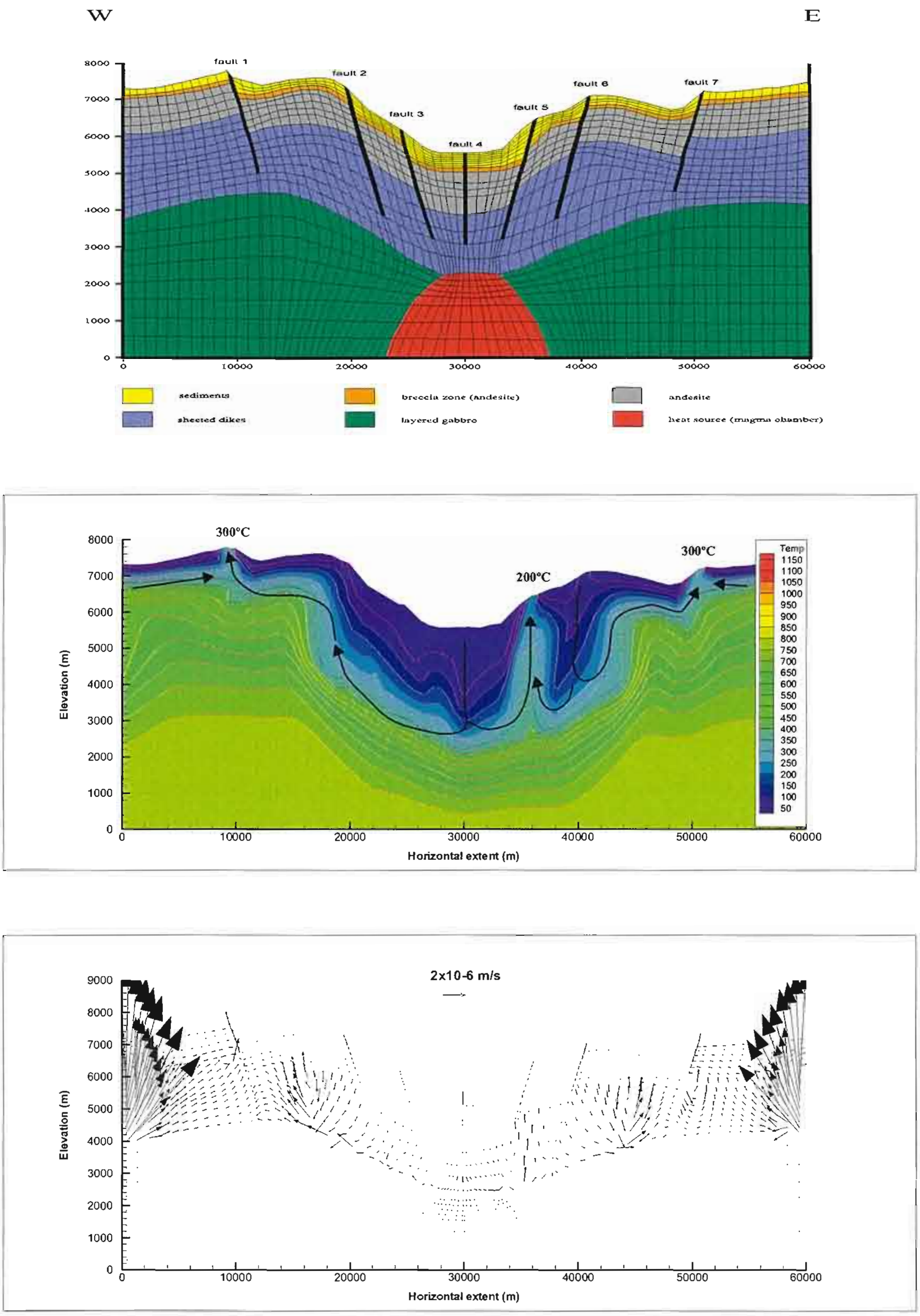
A 12 Modeling results for the 'realistic' Lau basin model under low rock (Breccia zone: $1.3x10^{-17}$ m^2, Andesite: 10^{-18} m^2) and average fault permeability ($2.5x10^{-14}$ m^2) conditions after 30,000 years. At this point, fluid discharge occurs through fault 2, 5, and 7 while other faults act as recharge zones. This convection scheme later changes to fluid discharge through the outer faults and recharge trough the inner faults, as observed in all other models; highest discharge temperatures are recorded for the outermost faults.







A 13 Modeling results for the ‘realistic’ Lau basin model for average rock (Breccia zone: $1.3x10^{-16}$ m^2, Andesite: 10^{-17} m^2) and high fault permeability ($2.5x10^{-13}$ m^2) after 10,000 years. Fluid exit velocities are significantly higher compared to lower fault permeabilities, while fluid discharge occurs through fault 1, 2, 5, and 7. Eventually, fluid discharge occurs primarily through the outer faults as observed before but the life span is reduced due to a more effective cooling of the heat source.



A 14 Modeling results for the 'realistic' Lau basin model with average rock (Breccia zone: $1.3x10^{-16}$ m^2, Andesite: 10^{-17} m^2) and average fault permeability ($2.5x10^{-14}$ m^2) and open side boundaries after 30,000 years. A central recharge zone develops, which enables discharge through the outer fault. Significant additional fluid flow is recorded from the side boundaries, leading to increased fluid discharge though the outermost faults later in the life of the hydrothermal system.

Appendix A 15 Stratigraphy of the Archean Pilbara Craton in the North Shaw area (after Van Kranendonk and Morant, 1998)

Group	Age (Ma)	Formation	Lithology
Fortescure Group	2765 - 2715	Maddina Fm.	massive to vesicular basalt and agglomerate
		Tumbiana Fm.	pisolitic and felsic tuff
		Kylena Fm.	thick basalt flows
		Hardey Fm.	conglomerate, shales and sandstone, local tuff and agglomerate
		Mount Roe Fm.	basalt, locally glomeroporphyritic; agglomerate
De Grey Group	~ 2950	Lalla Rookh Sandstone	conglomerate, sandstone, minor shale
Gorge Creek Group	< 3235	Pyramid Hill Fm.	banded iron formation (BIF)
		Honeyeater Basalt	basalt
		Dalton Suite	layered ultramafic-mafic sills in Soansville subgroup
		Paddy Market Fm.	Fe-shale, locally silicified to grey and white chert
		Corboy Fm.	sandstone, mudstone, minor conglomerate
		Pincunah Hill Fm.	Fe-shale, BIF, interbedded sandstone, felsic volcanic rocks
Sulphur Springs Group	~ 3235	Kangaroo Caves Fm.	mainly tholeiitic lavas (basalt – rhyolite) with comagmatic granite; chert, local megabreccia, iron formation and calk-alkaline rhyodacite
		Kunagunarrina Fm.	pillow basalt, komatiite, chert, high-Mg basalt
		Leilira Fm.	wacke and rhyolite, sandstone, mudstone, chert
		Six Mile Creek Fm.	mafic volcanic rocks, minor felsic volcaniclastic rocks
	> 3238	Golden Cockatoo Fm.	cherty silicate-facies iron formation, rhyolite, quartzite and metapelite
Warrawoona Group	> 3471 - 3458	Euro Basalt	pillow basalt and chert, pillow tholeiitic basalt and chert, komatiite and high-Mg basalt[1]
		Strelley Pool Chert	quartzite and chert, stromatolites
		Panorama Fm.	Felsic lavas, tuffs, and tuffaceous sandstone
		Apex Basalt	carbonate-altered basalts, chert
		Towers Fm.	blue-black and layered chert, barite
		Duffer Fm.	dacitic tuff, agglomerate and lava
		Mount Ada Basalt	basalts and chert
		McPhee Fm.	talc-chlorite schist, chert, BIF, pelite
Coonterunah Group	3515	Double Bar Fm.	basalt and volcanogenic sedimentary rocks
		Coucal Fm.	mafic and felsic volcanic rocks, chert, carbonate, BIF
		Table Top Fm.	basalt, local komatiitic basalt

[1] includes the Six Mile Creek Formation, previously the base of the Sulphur Springs Group (Van Kranendonk, pers. comm., 2000)

A 16 Summary of modeling results for the Panorama model with 3 active faults (fault 1, 3, and 5)

Rock permeability (m^2)	Fault permeability (m^2)	Discharge faults	Recharge faults	Discharge duration (years)[1]	Discharge velocity (m/s) (maximum/average)[2]	Venting temperature (°C)	Alteration (max. w-r ratios)	Comment
Andesite/Basalt 2^{-17} Rhyolite/Dacite 2^{-18}	2.5^{-13}	1 5	3	~ 128600 ~ 108600	$1x10^{-7}/5x10^{-8}$ $2x10^{-7}/7x10^{-8}$	150-300 150-350	low except within faults 252	
	2.5^{-14}	1 5	3	~ 138600 ~ 118600	$1x10^{-7}/5x10^{-8}$ $2x10^{-7}/6x10^{-8}$	150-350 150-350	low except within faults 172	
	2.5^{-15}	1 5	3	~ 117400 ~ 69500	$9x10^{-8}/3x10^{-8}$ $4x10^{-8}/1x10^{-8}$	150-350 150-300	low except within faults 20	
Andesite/Basalt 2^{-16} Rhyolite/Dacite 2^{-17}	2.5^{-13}	1 5	3	~ 149900 ~ 67100	$9x10^{-7}/3.5x10^{-7}$ $1x10^{-6}/4x10^{-7}$	150-350 150-300	low except within faults 908	
	2.5^{-14}	1 5	3	~ 229100 ~ 148600	$6x10^{-7}/1.5x10^{-7}$ $8x10^{-7}/2x10^{-7}$	150-350 150-400	low except within faults 216	
	2.5^{-15}	1 3	3, 5	~ 128200 ~ 110000	$1x10^{-7}/5.5x10^{-8}$ $2x10^{-8}/1x10^{-8}$	150-350 150-300	high within faults; medium between faults 64	fault 3 changes from recharge to discharge
Andesite/Basalt 2^{-15} Rhyolite/Dacite 2^{-16}	2.5^{-13}	1 5	3	~ 37900 ~ 10800	$2x10^{-6}/8x10^{-7}$ $2x10^{-6}/9x10^{-7}$	150-350 150-400	low except within faults 1286	small numerical errors occur
	2.5^{-14}	1 3 5	3	~ 98600 ~ 600 ~ 20600	$1x10^{-6}/2.5x10^{-7}$ $3x10^{-7}/2x10^{-7}$ $5x10^{-7}/3x10^{-7}$	150-300 150-350 150-400	high within faults; medium alteration between faults, high left of fault 216	
	2.5^{-15}	1 5	3	~ 158300 ~ 108800	$1x10^{-7}/4.5x10^{-8}$ $3x10^{-8}/1x10^{-8}$	150-300 150-350	high to very high throughout volcanic package 93	
Andesite/Basalt 2^{-14} Rhyolite/Dacite 2^{-15}	2.5^{-13}	1 3 5	1, 3, 5	~ 2000 ~ 300 ~ 700	$5x10^{-7}/3.5x10^{-7}$ $2x10^{-6}/9x10^{-7}$ $2x10^{-6}/1.5x10^{-6}$	150-250 150-300 150-350	high within faults; medium between faults 1496	
	2.5^{-14}	1 5	3	~ 37900 ~ 5500	$1x10^{-6}/9x10^{-7}$ $1x10^{-7}/9x10^{-8}$	150-350 150-200	high within faults; medium to high alteration between faults and left of faults 664	numerical errors occur; erratic heat and fluid flow
	2.5^{-15}	1 3	3, 5	~ 109700 ~ 1000	$2x10^{-7}/9x10^{-8}$ $6x10^{-8}/5x10^{-8}$	150-350 150	high to very high within volcanic package 341	

1 defined here as fluid discharge having temperatures ≥150 °C in at least one fault

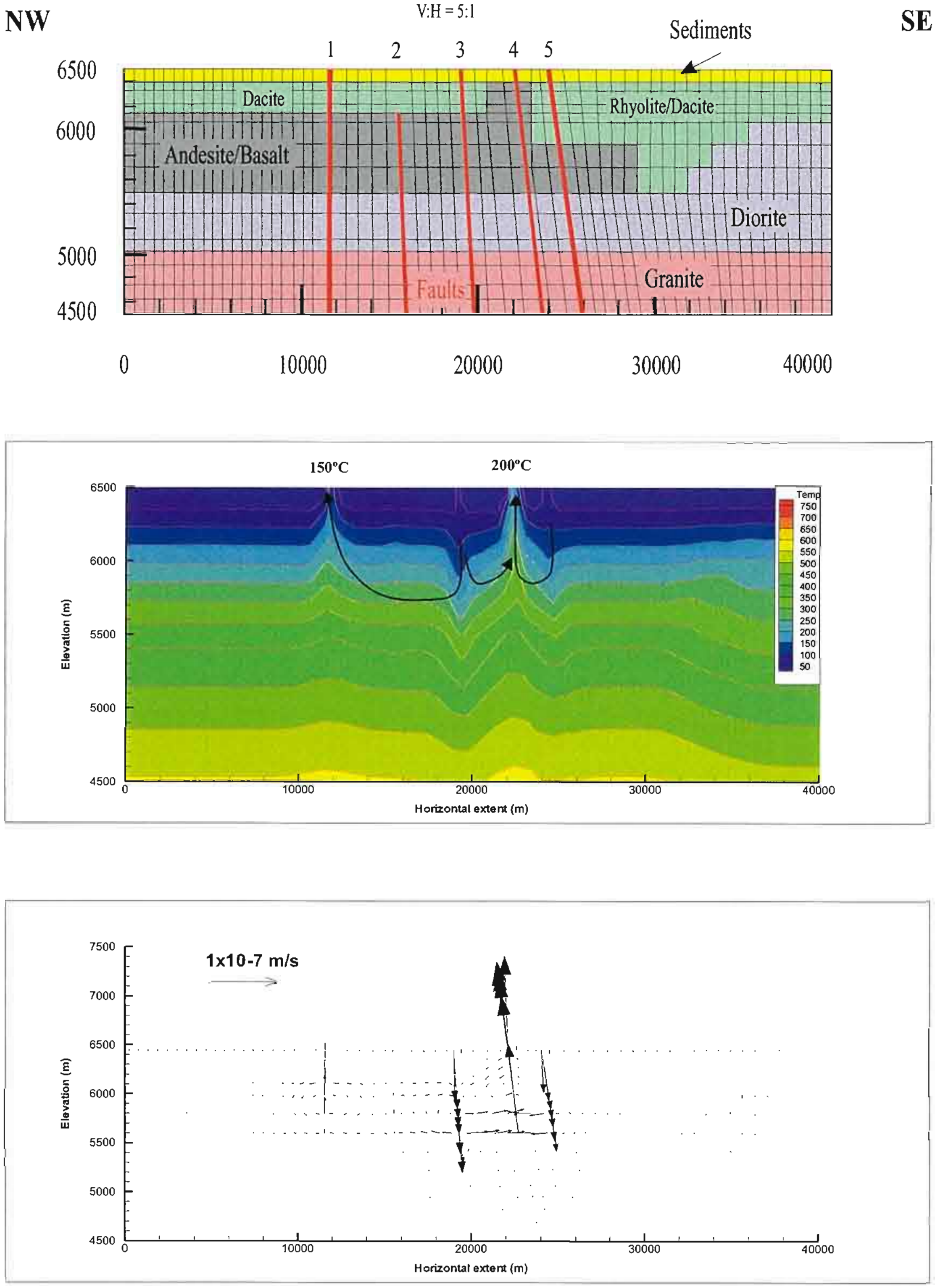
2 average calculated from maximum and minimum recorded fluid velocity values for discharge temperatures ≥150 °C

A 17 Summary of modeling results for the Panorama model with all faults activated

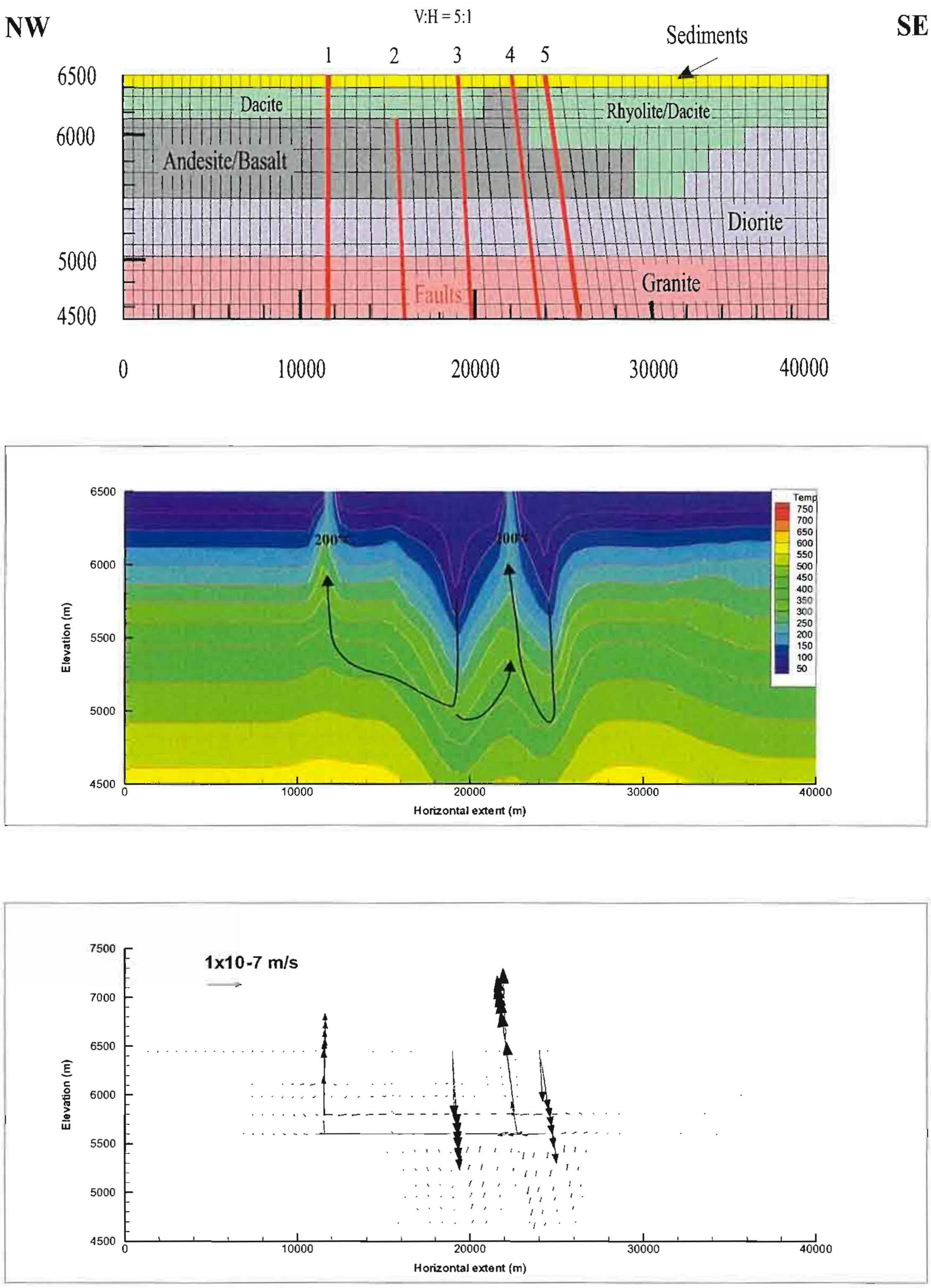
Rock permeability (m^2)	Fault permeability (m^2)	Discharge faults	Recharge faults	Discharge duration (years)[1]	Discharge velocity (m/s) (maximum/average)[2]	Venting temperature (°C)	Alteration (max. w-r ratios)	Comment
Andesite/Basalt 2^{-17} Rhyolite/Dacite 2^{-18}	2.5^{-13}	2	1,3,5	13600	$1x10^{-6}/6x10^{-7}$	150-300	low except within faults 183	
		4		8000	$2x10^{-6}/7x10^{-7}$	150-300		
	2.5^{-14}	2	1,3,5	27600	$3x10^{-7}/2x10^{-7}$	150-250	low except within faults 145	
		4		16600	$5x10^{-7}/2.5x10^{-7}$	150-300		
	2.5^{-15}	2	1,3,5	36000	$7x10^{-8}/4.5x10^{-8}$	150	low except within faults 71	
Andesite/Basalt 2^{-16} Rhyolite/Dacite 2^{-17}	2.5^{-13}	1	1,3,5	51600	$1x10^{-7}/9x10^{-8}$	150	low except within faults 172	
		2		13900	$2x10^{-6}/9x10^{-7}$	150-400		
		4		2100	$1x10^{-6}/8x10^{-7}$	150-300		
		5		24800	$2x10^{-6}/6x10^{-7}$	150-300		
	2.5^{-14}	2	1,3,5	45700	$1x10^{-6}/4x10^{-7}$	150-350	low except within faults 172	
		4		11500	$1x10^{-6}/4x10^{-7}$	150-300		
	2.5^{-15}	1	3,4,5	8500	$7x10^{-8}/4x10^{-8}$	150-250	low except within faults 172	
		2		10200	$1x10^{-7}/8x10^{-8}$	200-250		
Andesite/Basalt 2^{-15} Rhyolite/Dacite 2^{-16}	2.5^{-13}	1	1,2,3,4	500	$7x10^{-8}/4x10^{-8}$	150-300	low except within faults 686	Numerical errors occur, erratic discharge
		2		1800	$1x10^{-7}/5x10^{-8}$	150-350		
	2.5^{-14}	1	2,3,4	21400	$1x10^{-6}/3.5x10^{-7}$	150-300	high within faults; low to medium alteration in volcanic package 216	
		2		400	$7x10^{-7}/5x10^{-7}$	150-300		
		3		7600	$2x10^{-7}/1.5x10^{-7}$	200-300		
		5		2800	$1x10^{-6}/5x10^{-7}$	150-300		
	2.5^{-15}	1	2,4	4300	$1x10^{-7}/6.5x10^{-8}$	150-250	high within faults; medium to high alteration in volcanic package 170	
		3		23000	$1x10^{-7}/1x10^{-7}$	150-250		
Andesite/Basalt 2^{-14} Rhyolite/Dacite 2^{-15}	2.5^{-13}	1	2,3,4	700	$6x10^{-6}/3x10^{-6}$	150-300	high within faults; medium between faults; medium to high left of faults 814	Numerical errors occur, erratic venting
		3		100	$7x10^{-6}/2x10^{-6}$	150-300		
		4		200	$1x10^{-5}/5x10^{-6}$	150-300		
		5		4300	$4x10^{-6}/2x10^{-6}$	150-300		
	2.5^{-14}	1	3,5	13200	$2x10^{-6}/1x10^{-6}$	150-350	high within faults and within volcanic package 224	
		2		200	$2x10^{-6}/1x10^{-6}$	150-350		
		4		11400	$3x10^{-7}/1x10^{-7}$	150-300		
		5		13700	$5x10^{-7}/3x10^{-7}$	150-250		
	2.5^{-15}	2	1,2,4,5	5900	$1x10^{-7}/5x10^{-8}$	150-200	high within faults and within volcanic package 301	

[1] defined here as fluid discharge having temperatures ≥150 °C in at least one fault

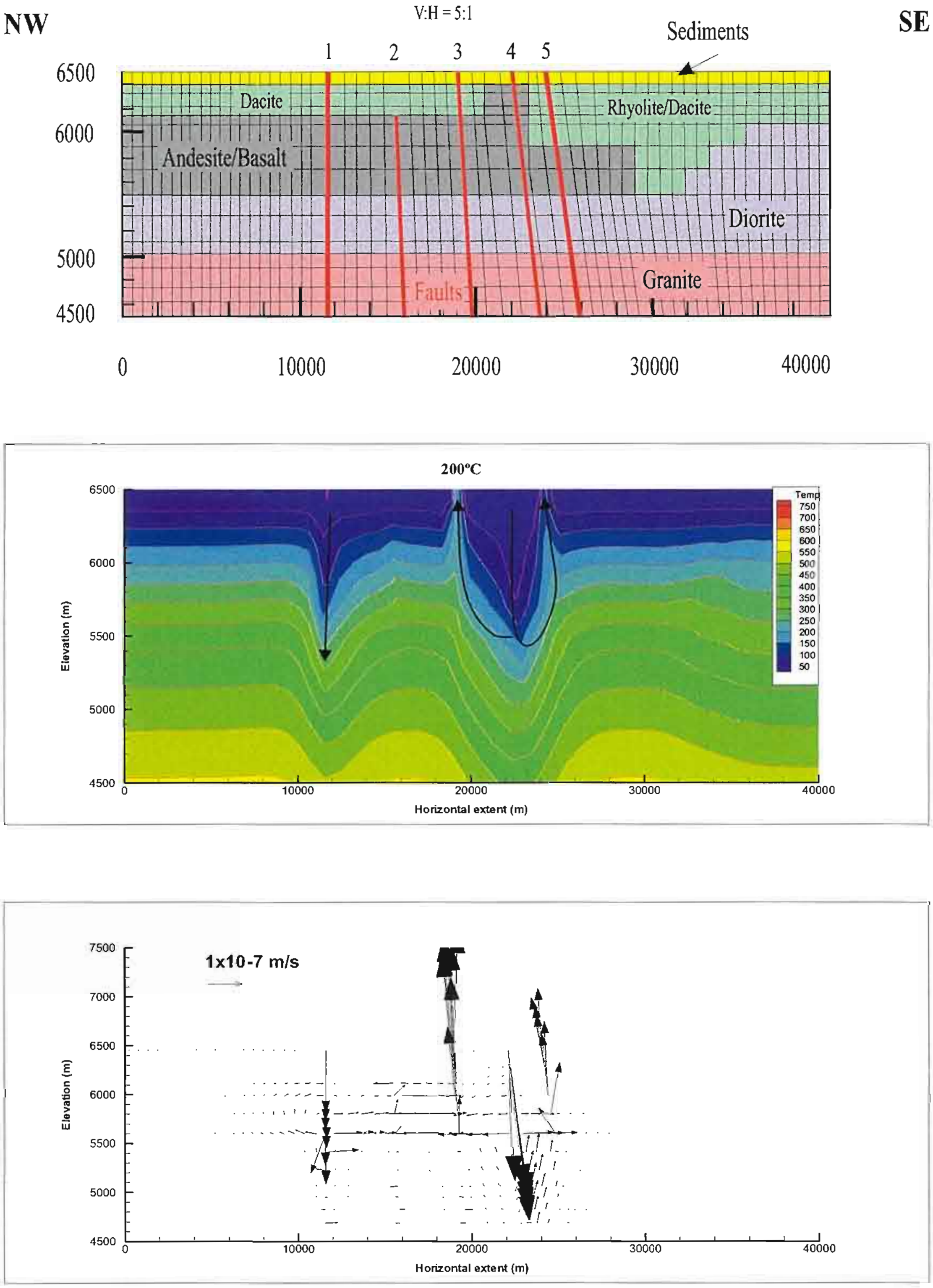
[2] average calculated from maximum and minimum recorded fluid velocity values for discharge temperatures ≥150 °C



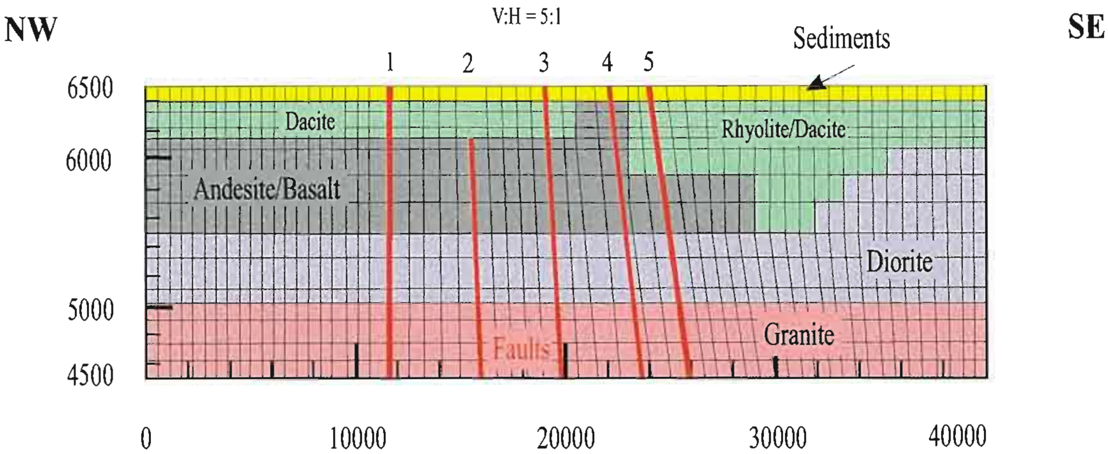
A 18 Modeling results for the Panorama model at very low rock (Andesite/Basalt: $2x10^{-17}$ m^2, Rhyolite/Dacite: $2.5x10^{-18}$ m^2) and low fault permeability ($2.5x10^{-15}$ m^2) after 65,000 years (midway point). Faults 1 and 4 are discharge faults while faults 3 and 5 act as recharge zones. For a listing of all other rock properties see table 5.1.

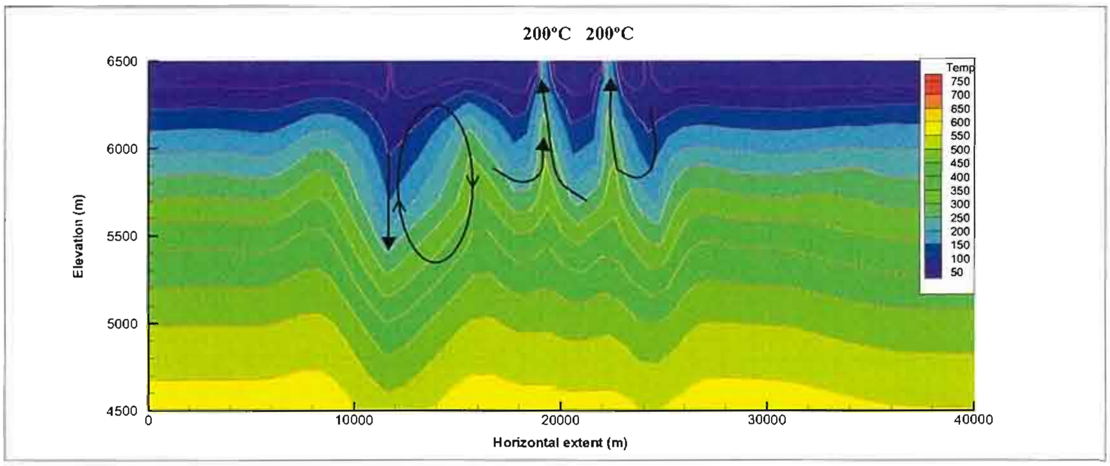


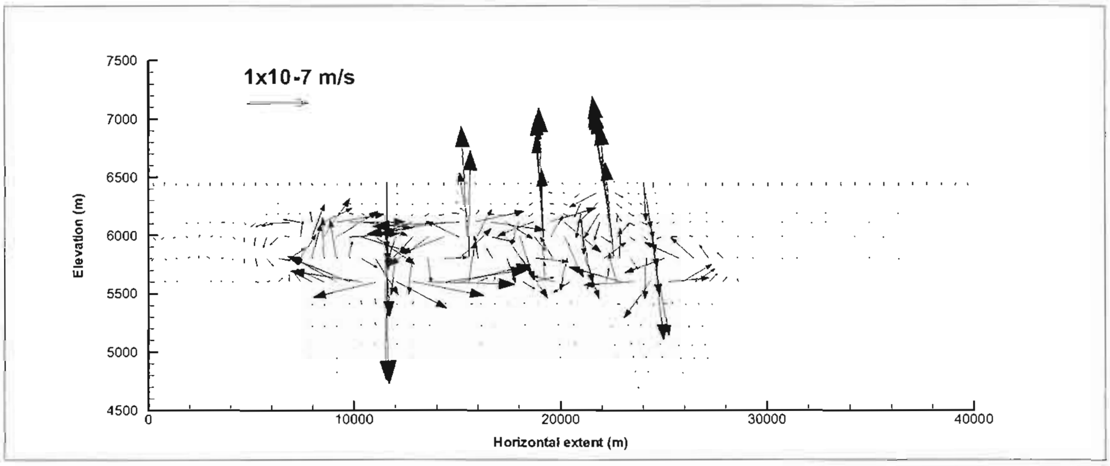
A 19 Modeling results for the Panorama model at very low rock (Andesite/Basalt: $2x10^{-17}$ m^2, Rhyolite/Dacite: $2.5x10^{-18}$ m^2) and average fault permeability ($2.5x10^{-14}$ m^2) after 100,000 years (midway point). Faults 1 and 4 are discharge faults while faults 3 and 5 act as recharge zones.



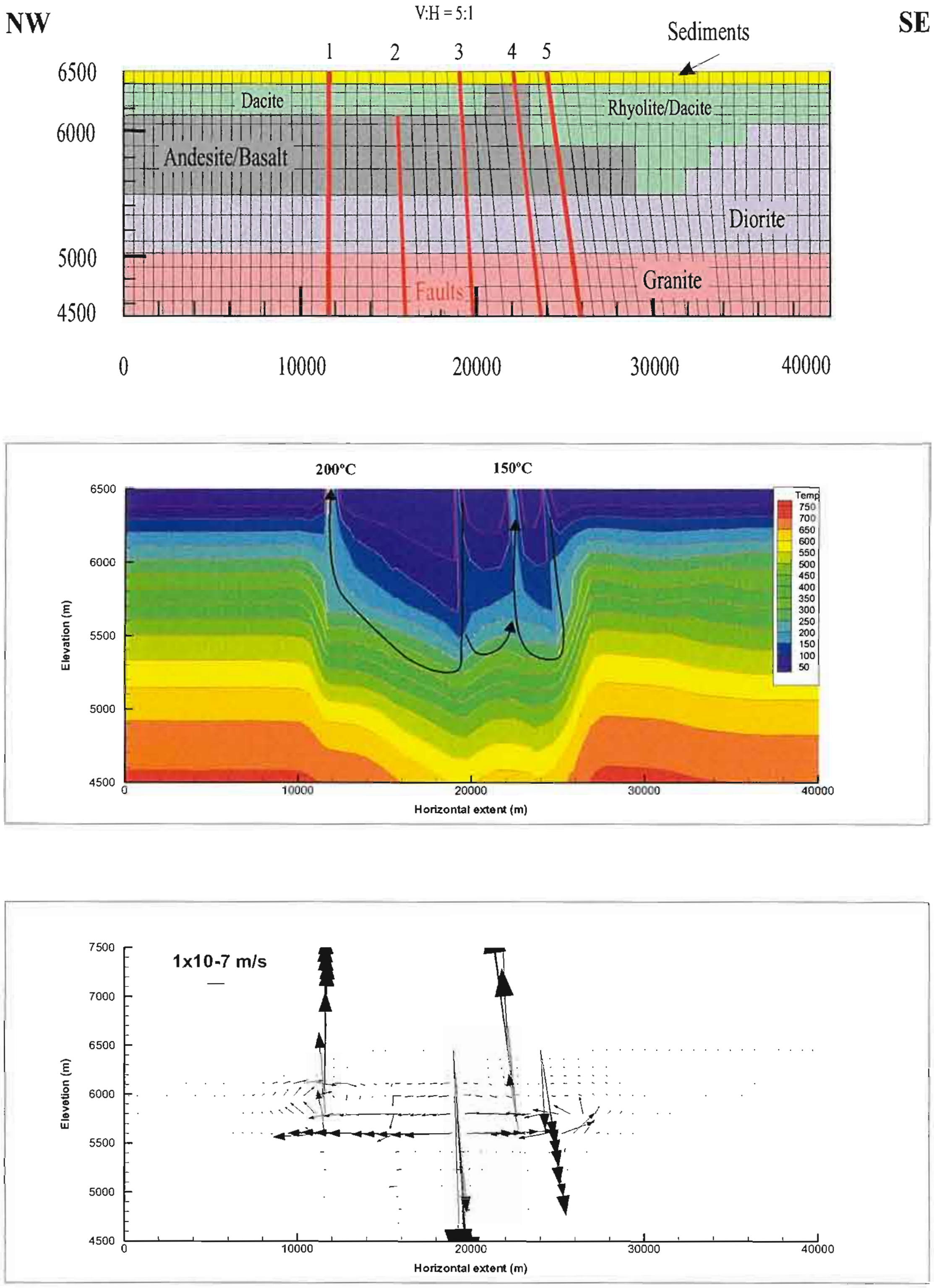
A 20 Modeling results for the Panorama model at very low rock (Andesite/Basalt: $2x10^{-17}$ m^2, Rhyolite/Dacite: $2.5x10^{-18}$ m^2) and high fault permeability ($2.5x10^{-13}$ m^2) after 65,000 years (midway point). Here, faults 3 and 5 are discharge faults, while fluid recharge is observed mainly through fault 4. Compared to Appendix A 18, hydrothermal activity is more intense (compare size of reference fluid velocity vectors).



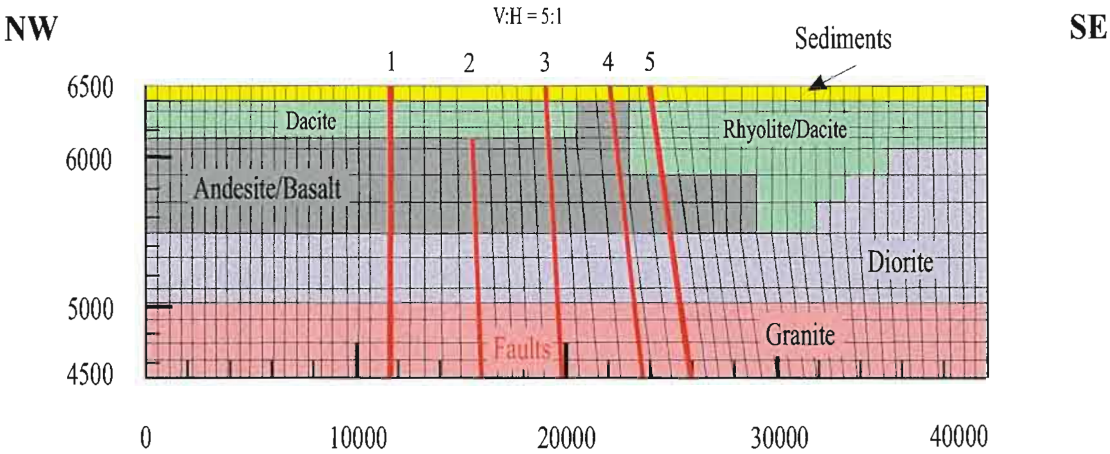


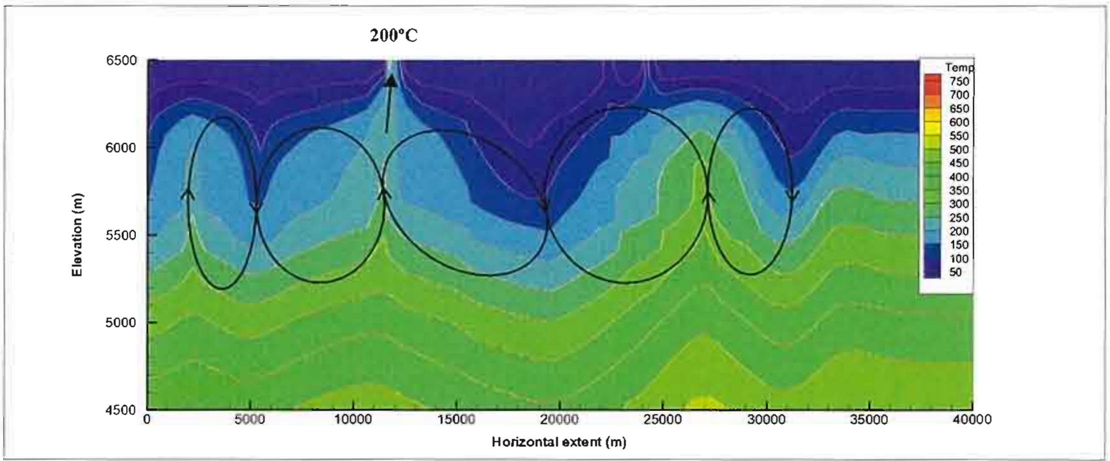


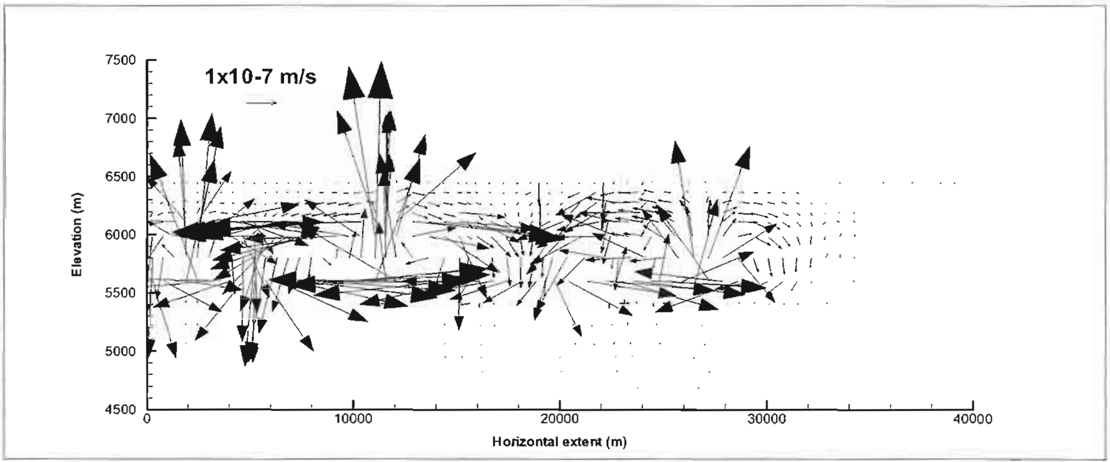
A 21 Modeling results for the Panorama model at low rock (Andesite/Basalt: $2x10^{-16}$ m^2, Rhyolite/Dacite: $2.5x10^{-17}$ m^2) and low fault permeability ($2.5x10^{-15}$ m^2) after 70,000 years (midway point). Under these conditions, faults 3 and 4 are discharge faults while faults 1 and 5 show fluid recharge.



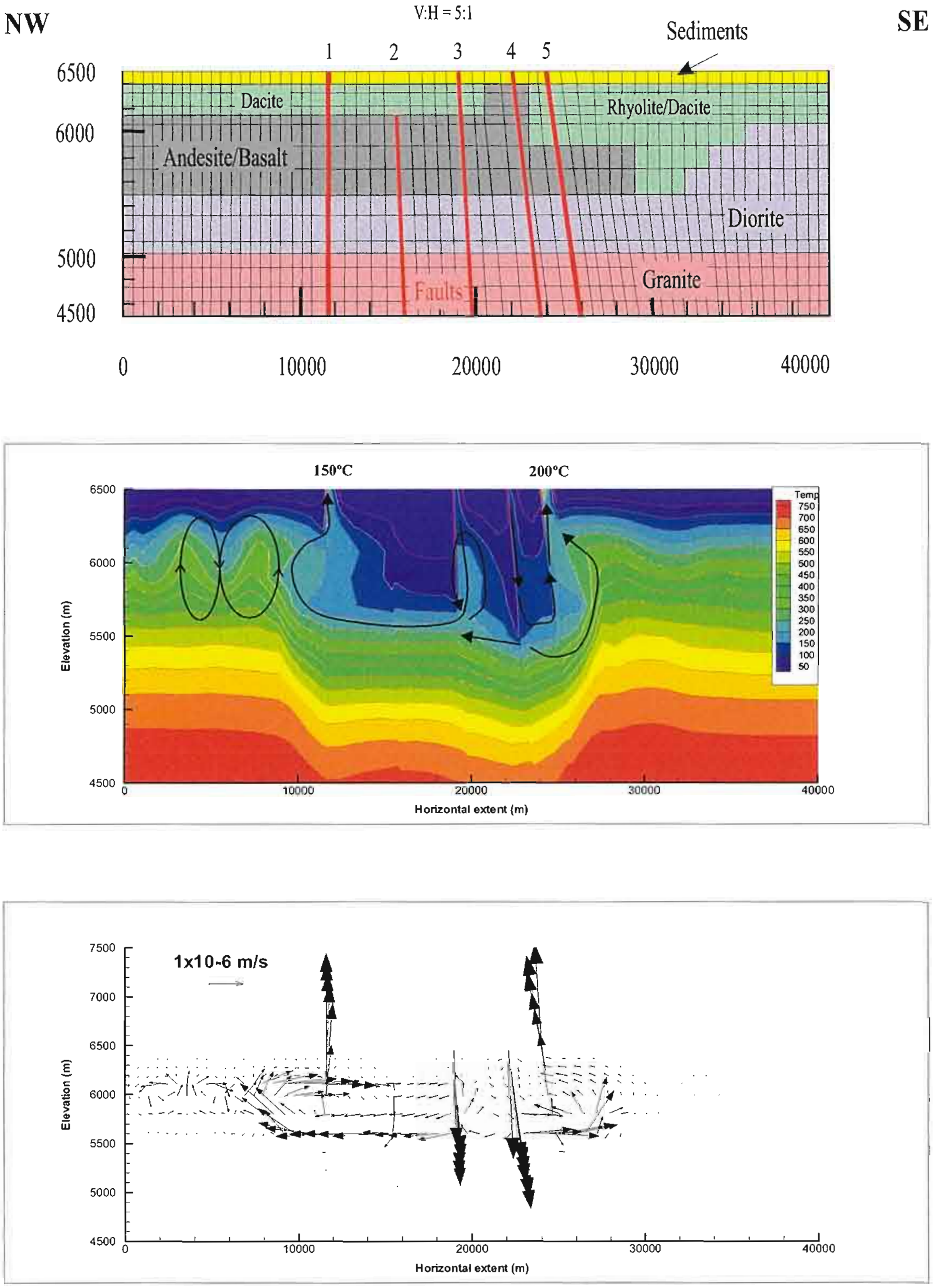
A 22 Modeling results for the Panorama model at low rock (Andesite/Basalt: $2x10^{-16}$ m^2, Rhyolite/Dacite: $2.5x10^{-17}$ m^2) and high fault permeability ($2.5x10^{-13}$ m^2) after 22,000 years (midway point). Large recharge zones develops around fault 3 and 5, producing hydrothermal fluid discharge through fault 1 and 4.



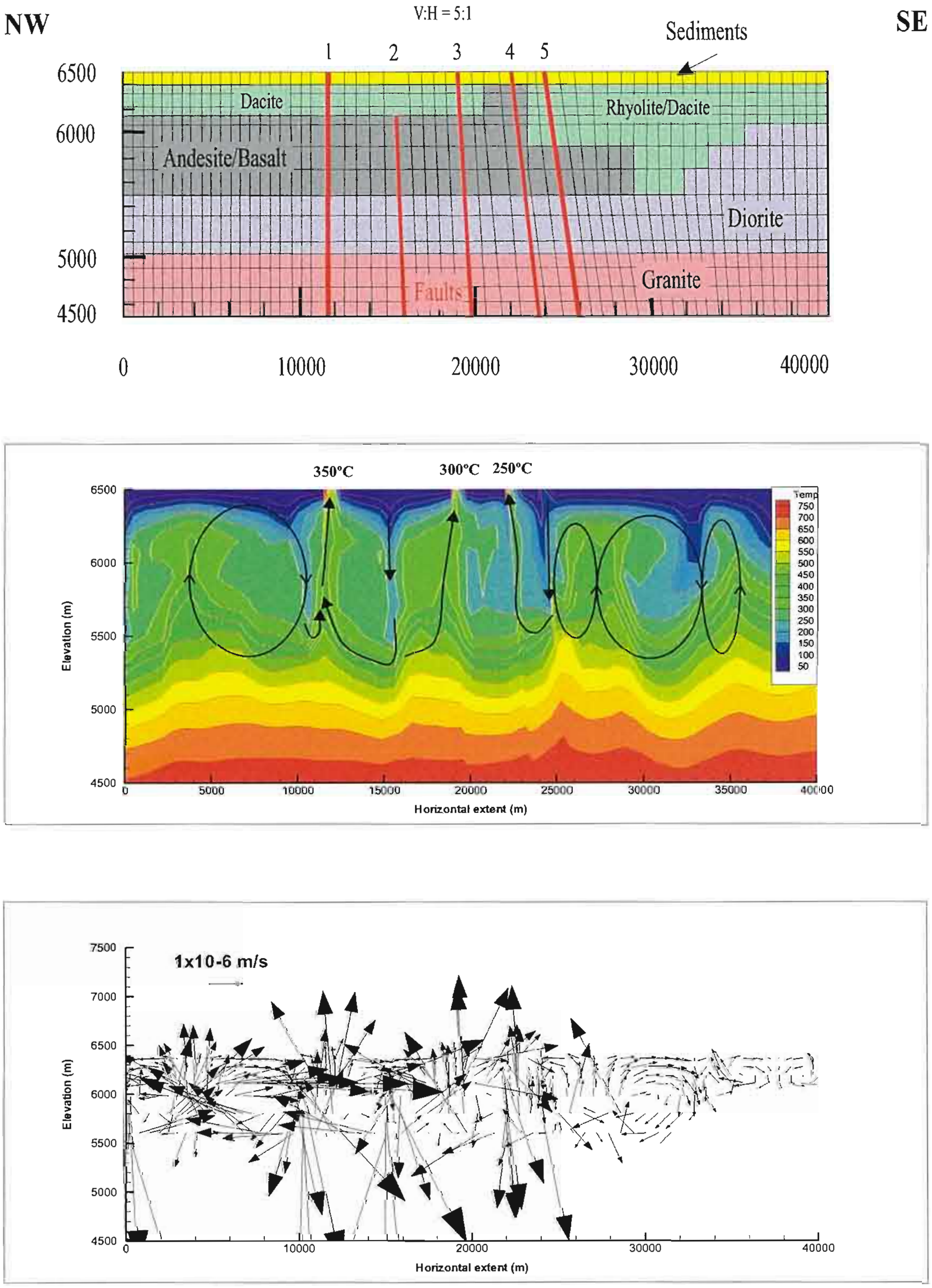




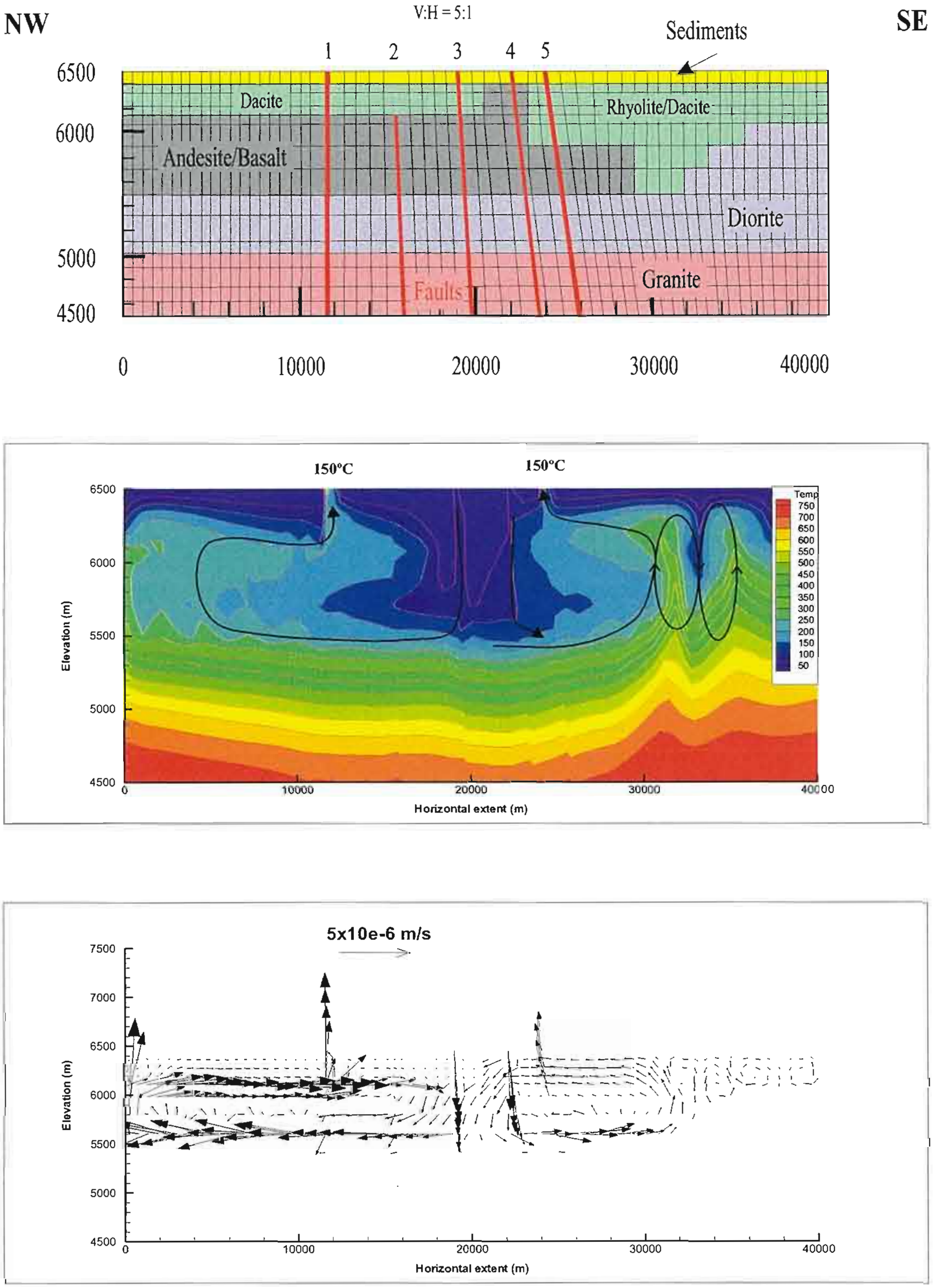
A 23 Modeling results for the Panorama model at average rock (Andesite/Basalt: $2x10^{-15}$ m^2, Rhyolite/Dacite: $2.5x10^{-16}$ m^2) and low fault permeability ($2.5x10^{-15}$ m^2) after 90,000 years (midway point). At this stage in the calculations most hydrothermal discharge activity has waned but fault 1 is still showing significant fluid discharge with fault 3 being the major fluid recharge zone. There is still significantly hydrothermal convection occurring within the andesite-basalt rock package due to increased rock permeability.



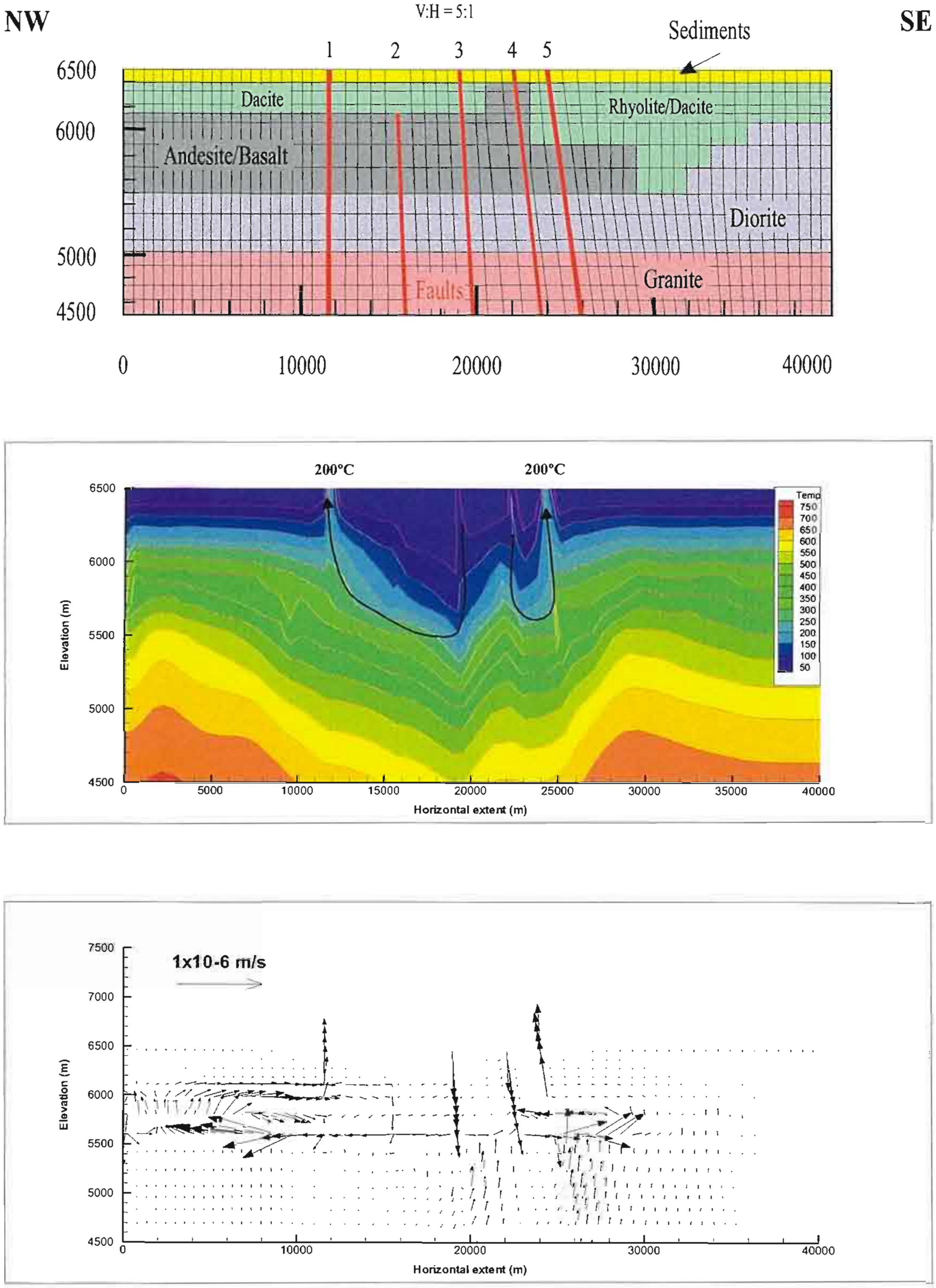
A 24 Modeling results for the Panorama model at average rock (Andesite/Basalt: $2x10^{-15}$ m^2, Rhyolite/Dacite: $2.5x10^{-16}$ m^2) and high fault permeability ($2.5x10^{-13}$ m^2) after 10,000 years (midway point). Fluid flow velocities are much higher compared to simulations at lower permeabilities (see dimension of reference fluid velocity arrow) with fluid discharge occurring through faults 1 and 5 as a consequence of the large recharge zone developing in the center of the model.



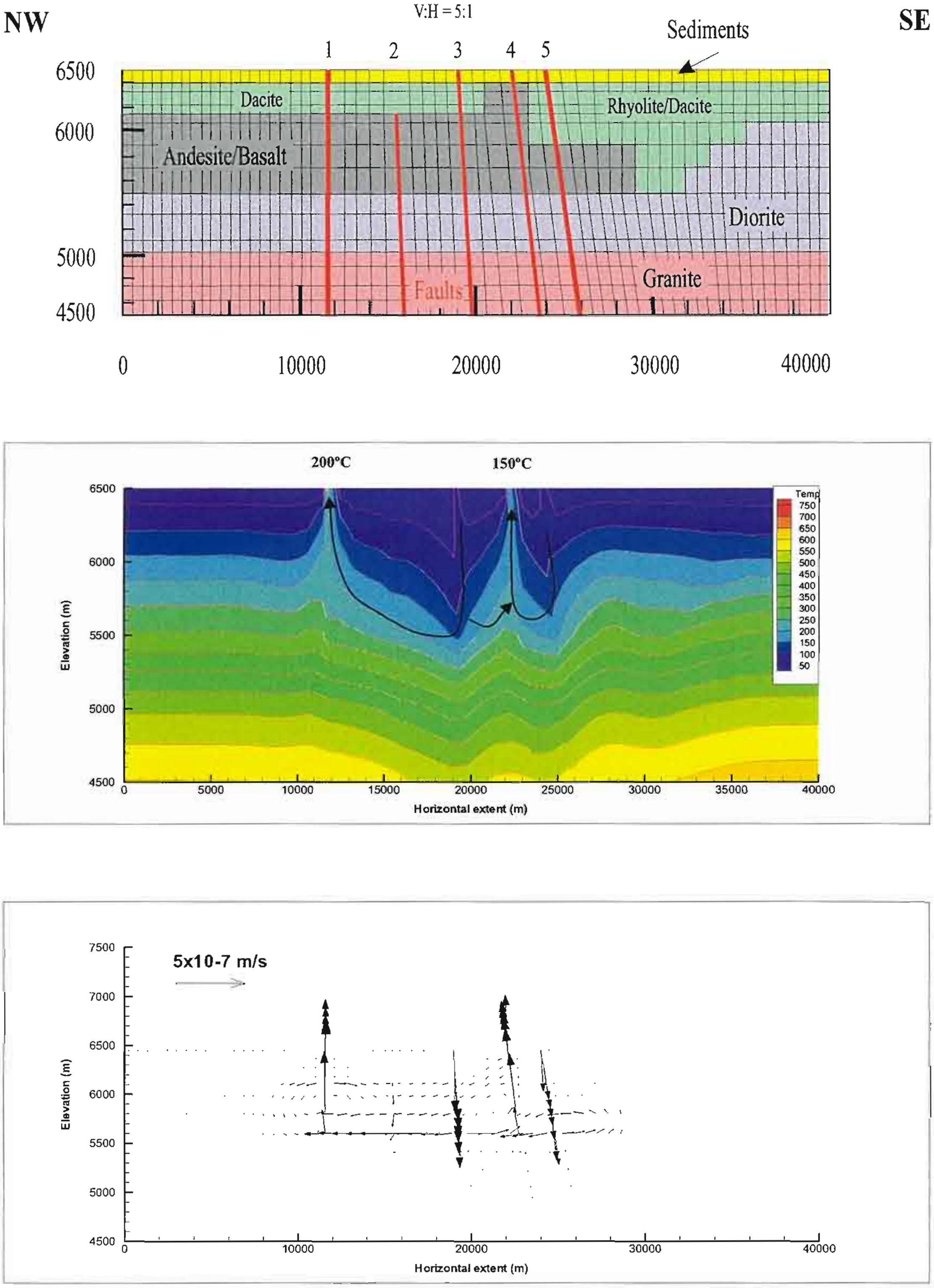
A 25 Modeling results for the Panorama model at high rock (Andesite/Basalt: $2x10^{-14}$ m^2, Rhyolite/Dacite: $2.5x10^{-15}$ m^2) and low fault permeability ($2.5x10^{-15}$ m^2) after 10,000 years (midway point). Faults 1, 3, and 4 are prominent discharge areas and a number of strong convection cells develop within the andesite-basalt layer. There is generally an increase in hydrothermal fluid convection and discharge activity as rock permeability increases.



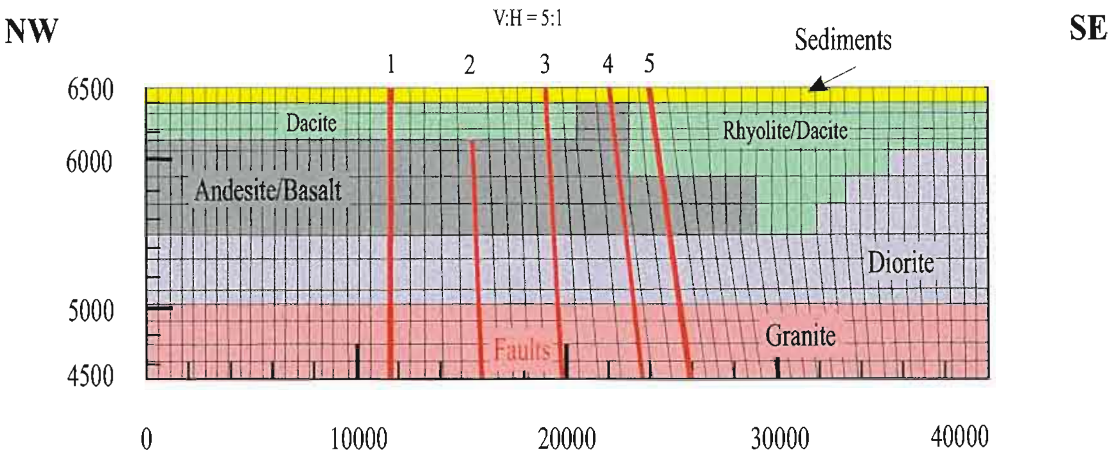
A26 Modeling results for the Panorama model at high rock (Andesite/Basalt: $2x10^{-14}$ m^2, Rhyolite/Dacite: $2.5x10^{-15}$ m^2) and high fault permeability ($2.5x10^{-13}$ m^2) after 7,500 years (midway point). Due to high fault and rock permeability, the life span of this simulation is rather short (~ 10,000 years) but fluid velocities are high and consequently some numerical errors occur. After 5,000 years a large central recharge zone is already established, affording fluid discharge through fault 1 and 5. Fluid discharge at fault 1 is at this stage likely affected by the 'boundary effect' discussed in chapter 4. Prominent lateral fluid flow occurs and only peripheral convection cells are predicted to form.

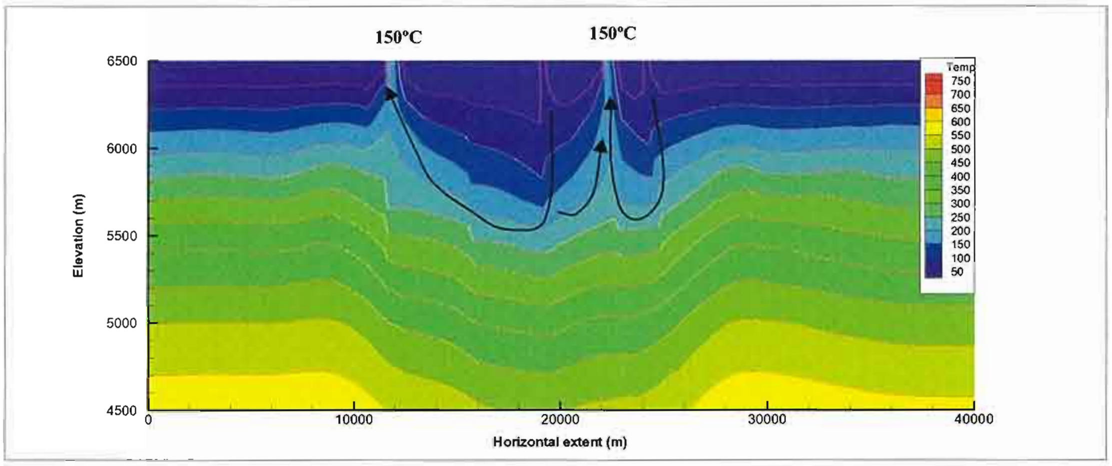


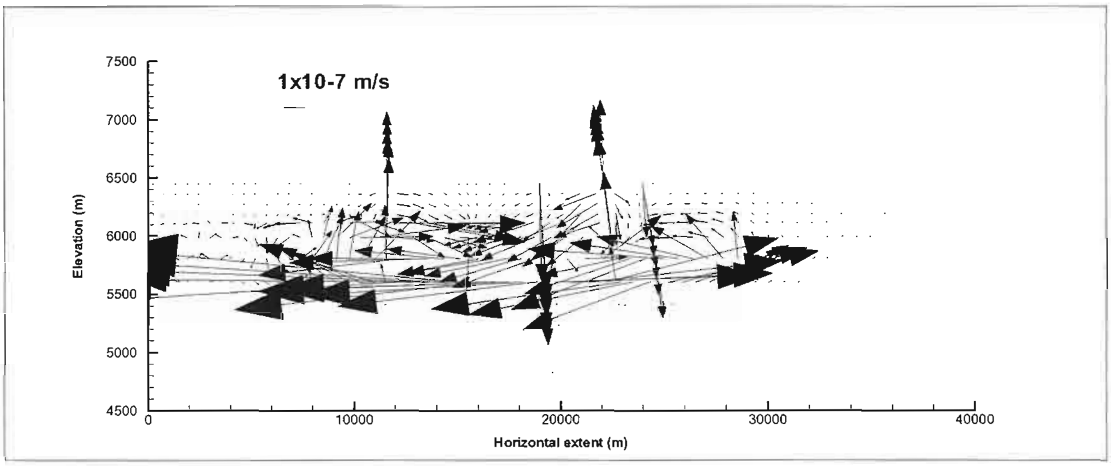
A 27 Modeling results for the Panorama model at low rock (Andesite/Basalt: $2x10^{-16}$ m^2, Rhyolite/Dacite: $2.5x10^{-17}$ m^2) and average fault permeability ($2.5x10^{-14}$ m^2) with minimum thermal conductivity (0.8 - 2.5 W/m*C) after 26,000 years (midway point). As noted in chapter 5.3.1.1.3. no changes are observed for the hydrothermal fluid flow regime or discharge temperatures, but fluid discharge velocities are somewhat lower (compare with table 5.5).



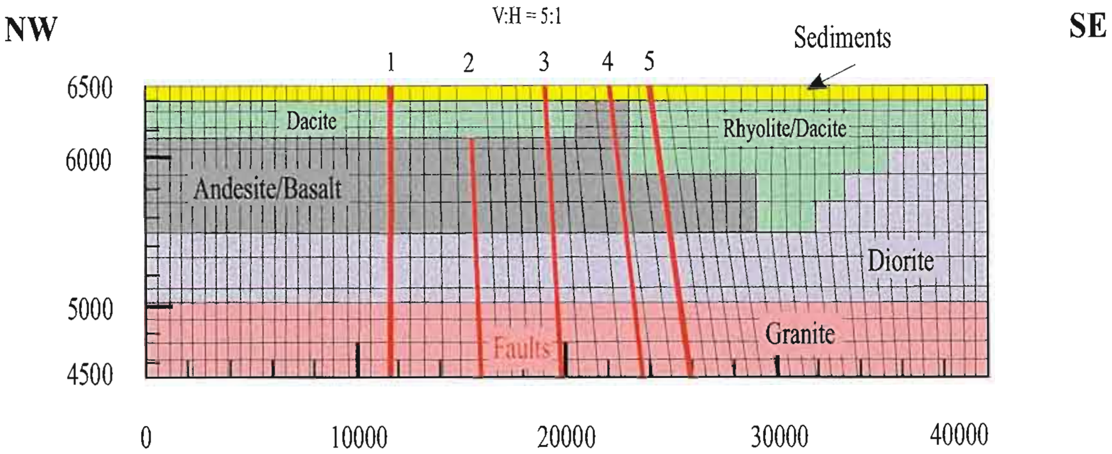
A 28 Modeling results for the Panorama model at low rock (Andesite/Basalt: $2x10^{-16}$ m^2, Rhyolite/Dacite: $2.5x10^{-17}$ m^2) and average fault permeability ($2.5x10^{-14}$ m^2) with maximum thermal conductivity (2.5 - 3.7 W/m*C) after 3,500 years (midway point). Increasing thermal conductivity significantly reduces the live span of the hydrothermal system but enhances fluid discharge velocities (see table 5.5). In addition, a shift of discharge duration between fault 4 and 5 occurs.

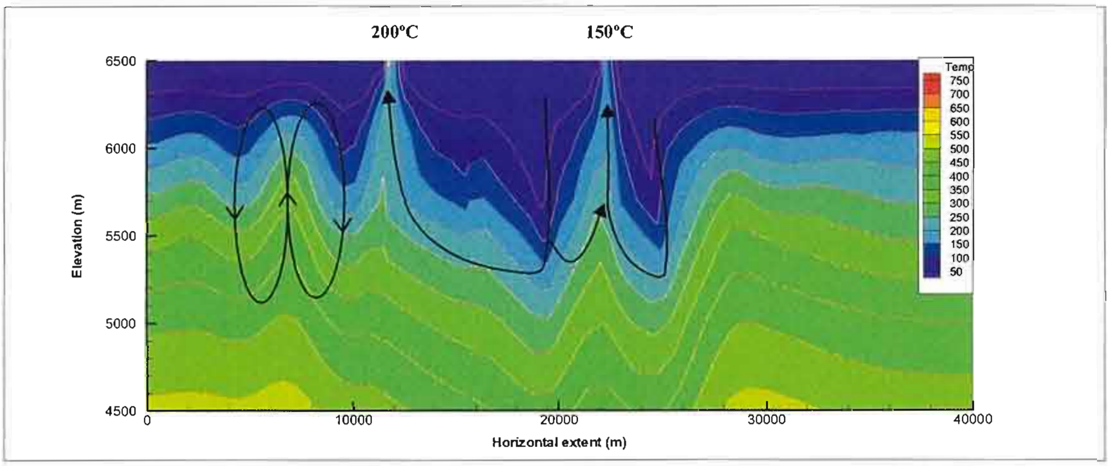


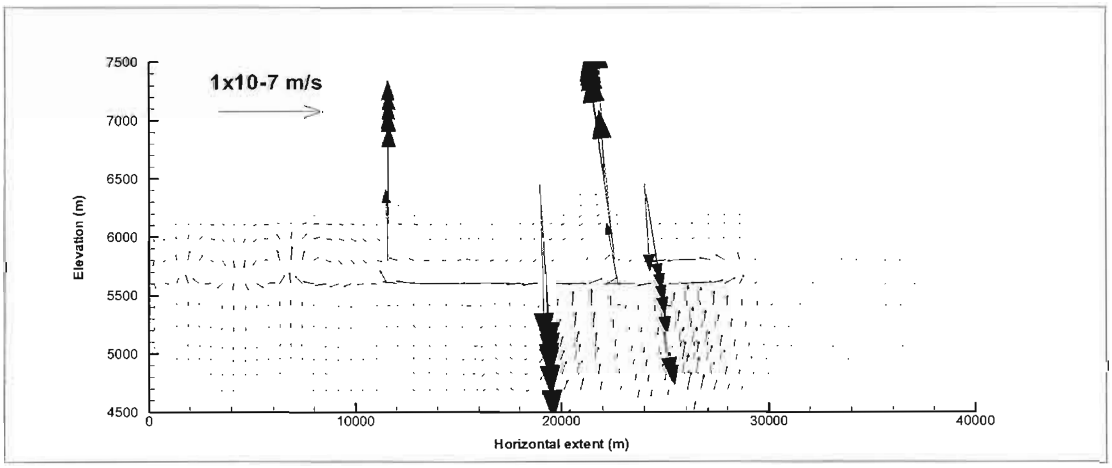




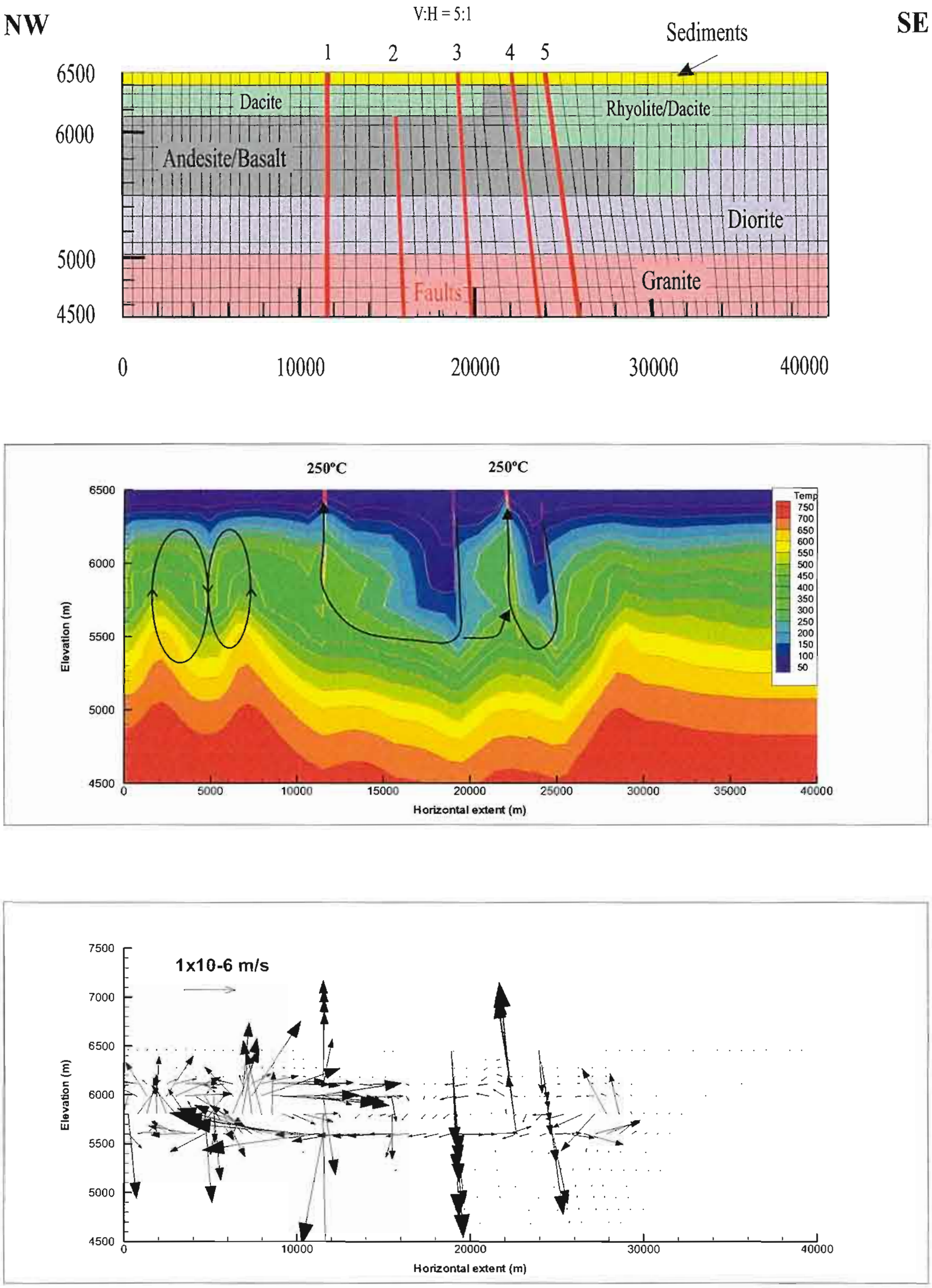
A 29 Modeling results for the Panorama model at low rock (Andesite/Basalt: $2x10^{-16}$ m^2, Rhyolite/Dacite: $2.5x10^{-17}$ m^2) and average fault permeability ($2.5x10^{-14}$ m^2) with minimum porosity (1 %) after 55,000 years (midway point). Faults 1 and 4 are discharge faults while faults 3 and 5 act as recharge zones; no significant changes are recorded compared to other porosity values.







A 30 Modeling results for the Panorama model at low rock (Andesite/Basalt: $2x10^{-16}$ m^2, Rhyolite/Dacite: $2.5x10^{-17}$ m^2) and average fault permeability ($2.5x10^{-14}$ m^2) with maximum porosity (20 - 25 %) after 100,000 years (midway point). As before, faults 1 and 4 are discharge faults with faults 3 and 5 acting as recharge zones; fluid velocities are higher (compare with appendix A 29) and discharge temperatures are lower compared to average conditions (see table 5.4)



A 31 Modeling results for the Panorama model at average rock (Andesite/Basalt: $2x10^{-15}$ m^2, Rhyolite/Dacite: $2.5x10^{-16}$ m^2) and average fault permeability ($2.5x10^{-14}$ m^2) with a simulated thermal cracking front (see chapter 5.5.3.3. for details) after 10,000 years (midway point). As for many other models, fluid discharge is predicted to occur through faults 1 and 4 and recharge through faults 3 and 5. No significant changes in the hydrothermal convection scheme is recorded; results from other models show that no thermal cracking front is required to predict discharge temperatures encountered on the modern seafloor.